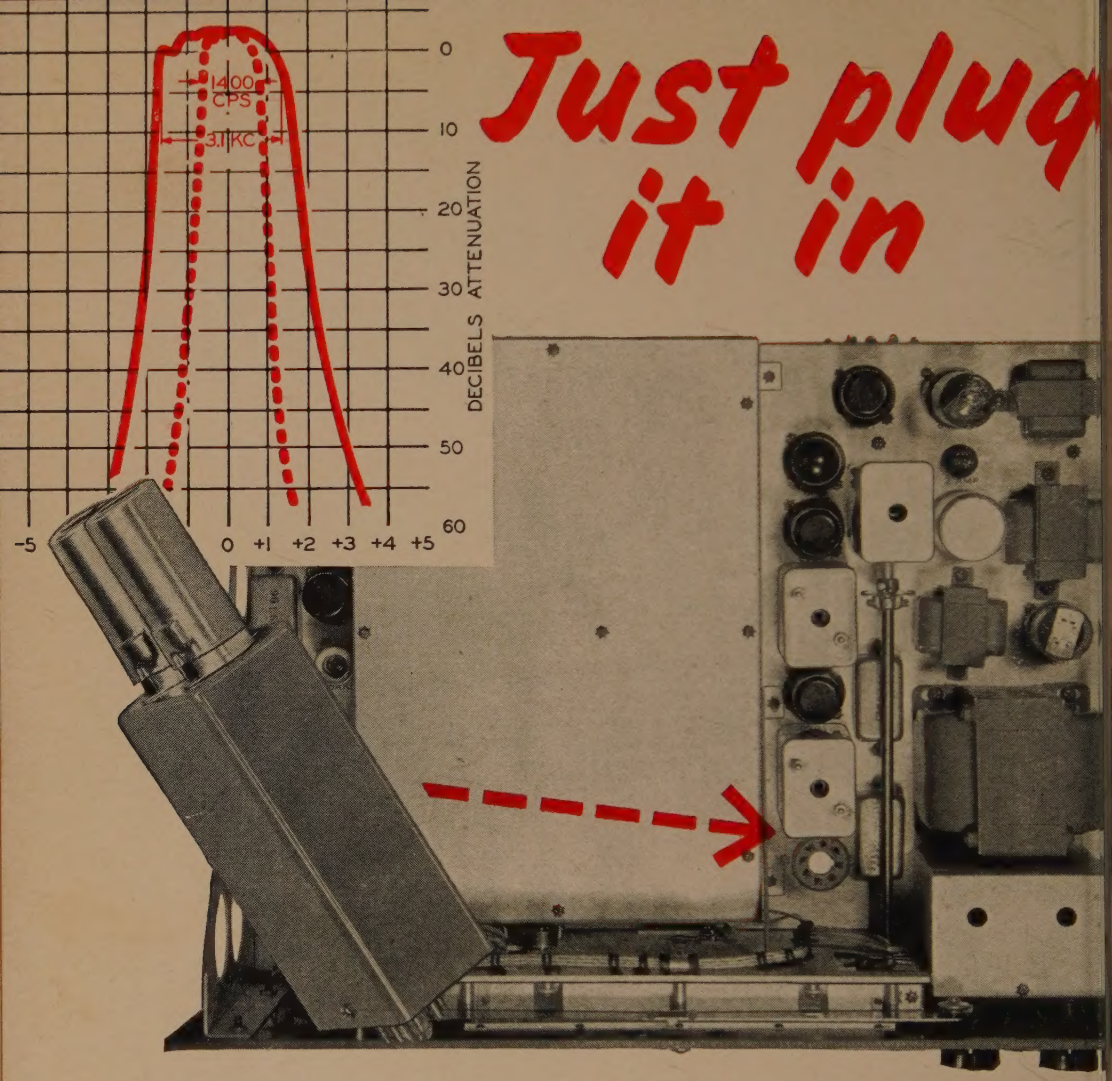
DECEMBER 1953

CQ RADIO AMATEURS' JOURNAL



Just plug it in

A Mechanical Filter for Your 75A-1!

IN A MATTER OF SECONDS your 75A-1 can be converted to incorporate the revolutionary new Collins mechanical filter! Just unplug the first 500 kc IF tube and plug in your choice of either the 1400 cycle or 3.1 kc unit. The 353C series plug-in adapter units for your 75A-1 will be available at your Collins distributor soon — contact him now for early delivery.

75A-2 OWNERS: Your Collins dealer now has 75A-2 mechanical filter conversion kits in stock. The 75A-2 kits are designed to be permanently wired into the set and include sockets for two plug-in mechanical filters. A type F455B-31 3.1 kc filter is included with each kit and a type F455B-08 800 cycle filter may be added at any time.

Type 353C-14 Plug-in Adapter, complete with 1400 cycle filter for 75A-1.....$ 75.00
Type 353C-31 Plug-in Adapter, complete with 3.1 kc filter, for 75A-1.....$ 75.00

Mechanical Filter Conversion Kit for 75A-2, complete with F455B-31 3.1 kc Filter....$ 80.00
Factory conversion of 75A-2, including installation of mechanical filter kit, minor repairs, and realignment.....$105.00

Plug-in filters for converted 75A-2's and new 75A-3's:

F455B-08, 800 cycle.....$ 55.00
F455B-31, 3.1 kc.....$ 55.00
F455B-60, 6.0 kc (available now).....$ 55.00

Solder Terminal Filters:

F455A-08, 800 cycle.....$ 55.00
F455A-31, 3.1 kc.....$ 55.00
F455A-60, 6.0 kc.....$ 55.00

NOTE: 353C-14 and 353C-31 Adapters incorporate 500 kc solder terminal filters; they are designed for the 75A-1 receiver and will not operate in the 75A-2 or 75A-3.

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

COLLINS

11 W. 42nd St.
NEW YORK 36

1930 Hi-Line Drive
DALLAS 2

2700 W. Olive Ave.
BURBANK

CQ RADIO AMATEURS' JOURNAL

Vol. 9, No. 12
DECEMBER, 1953

CQ—(title Reg. U.S. Post Office)—is published monthly by Cowan Publishing Corp. Executive and Editorial offices, 67 West 44th Street, New York 36, N. Y. Phone MUrray Hill 7-2080. Reentered as Second Class Matter February 6, 1951 at the Post Office, New York, N. Y. under the Act of March 3, 1879. Subscription rates in U.S.A. Possessions, APO & FPO, 1 year $3.00; 2 years $5.00; 3 years $7.00. Elsewhere add $1.00 per year for postage. Single copies 35 cents. Printed in U.S.A.

POSTMASTER: SEND FORM 3579 to CQ. 67 WEST 44th ST., NEW YORK 36, N. Y.

FEATURE ARTICLES

Versatile 70 Watts
Ernest F. Hiser, Jr., W4OJX 15

Test Equipment in the Ham Shack
Howard Burgess, W5WGF 23

The FB (Folded-Bent) Antenna
Captain R. R. Hay, USN, W4LW 58

Commentaries:

SOME EXPERIMENTAL DATA ON THE 6CL6
Edward Rasmussen and S. T. McNeal, W6LDJ 28

BREAK-IN MONITORING UNIT
Otto L. Woolley, WØSGG 28

USE A FUSE
Edward J. Brauner, W2URF 29

A SIMPLE INTERCOM TO THE HAM SHACK
Ed Marriner, W6BLZ 30

Departments

The VHF-UHF News 31
DX and Overseas News (KV4AA) 41
Ionospheric Propagation Conditions (KV4AA) 44
The YL's Frequency (W5RZJ) 46
The Novice Shack (W9EGQ) 48

Miscellaneous

Snorlock Ohms 6
Broad Band 11
Zero Bias 13
Our Cover 62
Yearly Index to CQ 70

Just in

TWO

SWR BRIDGE

Provides accurate measurement of standing wave ratios to insure most effective use of a low pass filter and antenna coupler for ultimate in TVI suppression. 52 ohms impedance can be changed to 70 ohms or other desired value. Equipped with SO-239 connectors and polarized meter jacks. **250-24 SWR Bridge, $9.75 Amateur Net.**

JOHNSON KEYS

Practice sets, semi-automatic, standard, and practice keys. Semi-automatic models adjustable from lowest to highest speeds. Standard and practice keys feature coin silver contacts and operate with a light keying touch: **$1.45 to $21.00.**

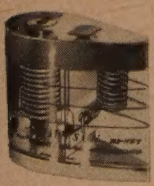
VIKING MOBILE KIT

Power packed mobile. 807 amplifier, 60 watts maximum input, 100% amplitude modulated with PP807's. Gang-tuned, band-switching, 5 bands (75, 40, 20, 15 and 10) with VFO provision. Series tuned output links . . . solve loading problems. Dash mounting—easily accessible—illuminated meter. **240-141 Viking Mobile Kit Complete, less tubes, microphone, power supply and antenna, $99.50 Amateur Net. Also available wired and tested.**

VIKING II TRANSMITTER

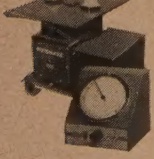
TVI suppressed. All amateur bands from 10 to 160 meters. 100 watts phone output, 130 watts CW. Instant bandswitching—VFO input provision—dual power supplies. All stages metered. Pi-network coupling output amplifier. Self contained—no plug-in coils. 100% amplitude modulation. **240-102 Viking II Transmitter Kit, complete with tubes, less crystals, key and mike. Amateur Net $279.50. Available wired and tested, $337.00 Amateur Net.**

JOHNSON BI-NET



Dual mobile antenna loading network for 10 and 20 meter amateur bands. Mounts in center of standard mobile whip—enables operator to change bands in motion. Operation is completely automatic, no relays or mechanical control required. After initial adjustment, BI-NET requires no further attention. Enclosed in streamlined, weatherproof plastic housing—equipped with 3/8"x24 female threads for antenna mounting. Size, 4 7/16" high, 5 5/16" long, 2 3/8" width, weight 14 oz. **250-22 Johnson "Bi-Net" $10.95 Amateur Net.**

JOHNSON ROTOMATIC ROTATOR



All-weather antenna rotator designed for rugged service. Light weight cast aluminum housing with 5/16" steel rotating table. Unit tilts for simplified beam adjustment. Safely supports dual beams weighing up to 175 pounds. Reversible 360° rotation. Slip rings handle up to 2 1/2 KW. Assembly includes control box with selsyn operated, illuminated dial. Controls, rotation switch, power switch and antenna relay switch. **138-112 Johnson Rotomatic Rotator, $324.00 Amateur Net.**

JOHNSON "MATCHBOX"

"Matchbox" loads an almost infinite variety of antennas from 3.5 to 30.0 mcs. Matches balanced antennas from 25 to 1200 ohms resistance. Loads unbalanced, or single wire antennas of approximately 25 to 3000 ohms resistance. Tunes out large amounts of reactance. Self-contained antenna changeover relay. Bandswitching—front panel controls—no internal adjustment required to change bands. **250-23 Johnson "Matchbox", assembled, wired, tested, $49.85 Amateur Net.**

JOHNSON SIGNAL SENTRY

Designed for monitoring either CW or phone signals without regard to operating frequency, the JOHNSON Signal Sentry is energized by transmitter RF. Receiver audio muted for break-in operation. Unit may be used as a code practice oscillator, with slight modification. Size: 3 7/8"x3 3/4" x3 3/4". Tubes required, but not furnished: one 12AX7 and one 12AU7. Weight: approx. 3 pounds.

250-25 Johnson Signal Sentry, completely assembled, less tubes; installation instructions included.

$14.70 AMATEUR NET

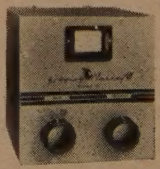
VIKING MOBILE VFO

A diminutive variable frequency oscillator designed specifically for mobile use. Compensated for an extremely wide range of ambient temperatures, the JOHNSON Mobile VFO is only 4"x4 1/4"x5". Output is sufficient to drive any straight pentode crystal stage as an amplifier. Circuit design, rigid construction, and heavy aluminum cabinet minimize frequency shift due to road shock and vibration. Tube line-up consists of a 6BH6 oscillator, 6BH6 isolation amplifier/frequency multiplier, 0A2 voltage regulator.

250-152 Viking Mobile VFO in complete kit form, less tubes; assembly and operating instructions included. $29.45 AMATEUR NET. Available factory assembled, less tubes; wired and tested, 250-152-2

$44.95 AMATEUR NET.

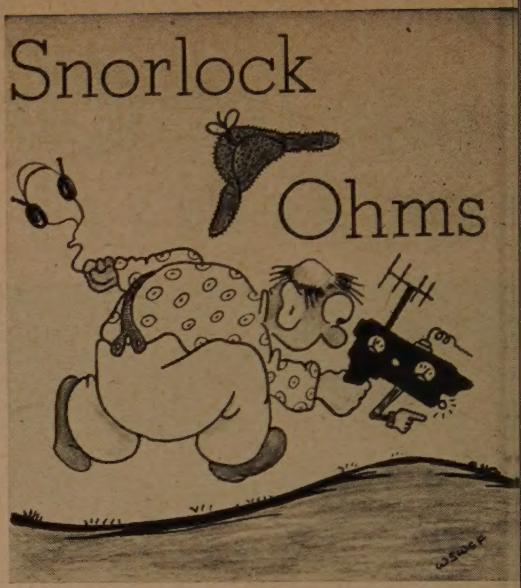
VIKING VFO



Accurately calibrated for all amateur bands from 10 to 160 meters. Excellent stability, vernier tuning, clean keying, and perfect "break-in" on all bands. **240-122 Viking VFO kit complete, less tubes, $42.75 Amateur Net. Available wired and tested, $63.75 Amateur Net.**

LOW PASS RF FILTER

Consists of four individually shielded sections, capable of handling more than 1000 watts amplitude modulated RF. Provides 75 db harmonic attenuation in the antenna circuit. SO-239 coaxial connectors, assembled and pre-tuned. **250-20 Low Pass RF Filter, $16.50 Amateur Net.**



The Case of the Unusual CQ

"In precisely two minutes and 5 microseconds Inspector Louis Coupler will break the photo electric circuit at the gate, thus triggering of the visitor announcing mechanism," predicted Snorlock Ohms to his medico-friend, Watts Gnu as the two read the mail on the detective's hopped up crystal set.

"Astounding deduction!" exclaimed the medical man as he tried to recollect where he had mis laid his rubbers during an early morning ab dominal operation.

"Simple," yawned Snorlock. "Lousy ignition system on his car gives him away."

The chimes made a musical CQ and simultaneously colored lights flickered, siren screamed, firecrackers popped, and a huge fly swatter with the word TILT engraved thereon came whacking down on Snorlock's head. "I do believe someone has arrived," assayed Watts as Algernon, the robot valet, ushered the In spector into the Ham shack.

The obese Inspector was out of breath. Hi voice did a rapid QSB as he announced: "There has been a murder."

"You know the terms," was Snorlock's sti reply, because he was bored stiff. He massaged his bored-stiff limbs with radioactive snake oi and added: "The case must intrigue me."

"I'll come to the point," said Inspector Coupler, combing a strand of hair over th point on his head, "The internationally famou radio Ham, Count D'Extra, was found dead th morning at exactly ——"

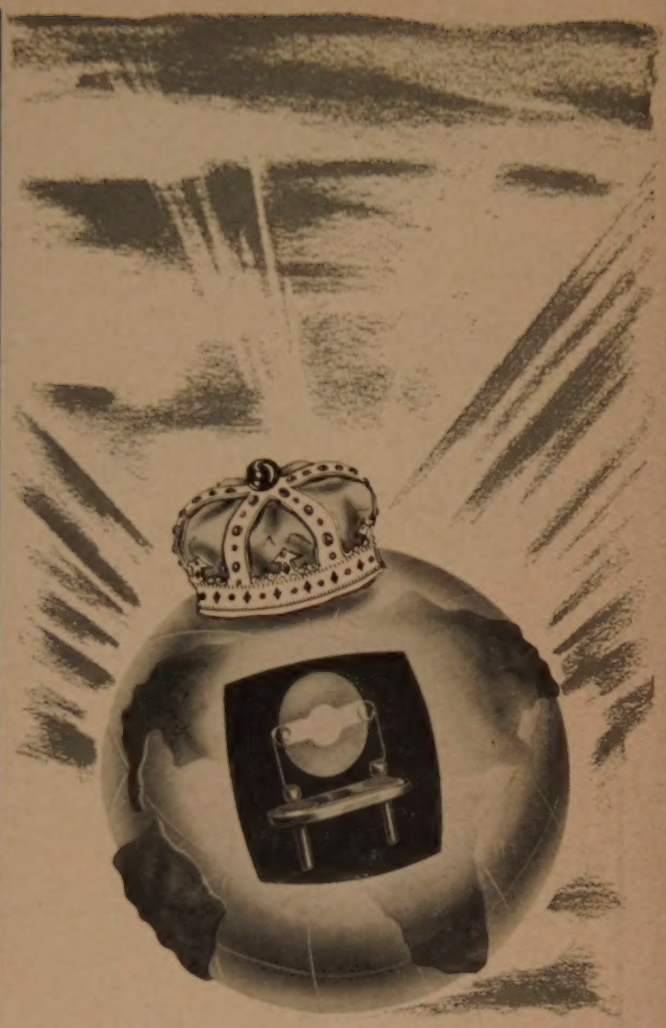
"2:59 a.m.," broke in Snorlock.

"Amazing! How did you know?"

"The first three digits of my social securi number," explained Snorlock.

"Count D'Extra!" exploded Watts. "Isn't th the chap who's been using rather unorthodo methods in calling CQ?"

(Continued on page 8)



- RESEARCH
- ENGINEERING
- CRAFTSMANSHIP
- PRECISION
- PRODUCTION
- DELIVERY
- QUALITY

THE INSIDE STORY

Top quality means top performance after long service. Bliley quality control far exceeds the perfunctory steps necessary to produce and ship crystals which meet a nominal specification.

Bliley precision process techniques, rigidly followed in orientation, slicing, lapping, and plating guarantee peak crystal performance. That extra touch of engineering and craftsmanship makes the big difference in your equipment.

That's the Bliley inside story!

Bliley CRYSTALS

BLILEY ELECTRIC COMPANY

UNION STATION BUILDING • ERIE, PA.

(from page 6)

"Precisely," verified Snorlock. "The enter prising chap has various sirens' voices on tap recordings calling CQ in every known language Men as old as 75 years have fallen prey to th mechanical temptresses' voices, only to fin themselves hooked into QSO with the grating gravel-voiced Count D'Extra. As a result, he known as the local DX king. Many Hams, fear, would have welcomed his demise."

"Tape recording!" ejaculated the Inspecto "That accounts for the twenty feet of tape tha strangled the life out of the Count."

Watts' face fell, but he caught it before i plopped into Snorlock's cuspidor. "One thou sand local Hams, all logical suspects, and not single clue!"

Snorlock patted Watts, affectionately. "I thin a man as clever as Count D'Extra will have le a clue. Come, let us be off."

"My car waits without," offered the Inspecto "Without a motor," said Snorlock, lifting th hood. From behind bushes came childish laugh ter as a dozen tikes dragged the Inspector's mo tor into a mud pool. The police official wa about to yell when Snorlock raised a restrainin hand. "Tut, tut, Inspector, would you break th spirit of uninhibited childhood!"

Rising to the occasion, Snorlock gave th robot, Algernon, a drink of No. 10 engine o after which the mechanical man climbed unde the hood and made like a motor . . .

Count D'Extra was slumped over a gold-plate microphone. The ends of the tape were tied i the form of a bow, a fact which did not escap the astute Snorlock. On a shelf, above the tran mitter, was a de-luxe tape recorder. "Hey! yelled the Inspector. "Maybe the Count tol us who the murder is on this recorder! I onc saw a movie — —"

Snorlock snorted disbelief, but the Inspecto turned on the recorder. The honey-sweet tone of a bewitching miss came forth: "Calling CQ CQ, CQ. Won't any one of you sweet darling come back to poor little me? Calling CQ, CQ CQ."

"Isn't that the voice of Dulcie Hotchordsi asked Watts. "The girl who was voted Mi Vocal Cheesecake of 1953?"

"Exactly," concurred Snorlock. "The wealth Count spent thousands of dollars for suitab CQ bait."

The Inspector rummaged through a tape fi of recordings. "Here's one," he said. "I labeled 'Use Only in Emergency.' "

The voice on this tape was that of a glamorou French actress. "*Mon cher,* for you alone I ca CQ, CQ, CQ. I wait the caress of your swe voice. CQ, CQ, CQ."

"Stop it!" warned Snorlock, as Watts we berserk and dived into the speaker.

(Continued on page 10)

(from page 8)

"I lost my head," admitted the sheepish Wa as the detective screwed it back on. Then: trust, gentlemen, my dear wife will not he of this."

"Jumpin' kilocycles," cried the Inspect "He's got 'em all catalogued — Texas dra Mid-Western and Southern accents, Spani and — —"

"I believe," reminded Snorlock, "we have murder to solve."

"Very well," said the Inspector, regretful "All right, let me hear the clues that I ov looked because I'm supposed to be so dumb."

"This is a true story," started Snorlock. "No first of all, the carefully adjusted bow knot tape around the Count's neck. The murder could not resist this sartorial touch because h himself, is addicted to bow ties."

Snorlock walked about, dramatically, stu bling over Watts' big feet. His other self pick himself up, and the private eye continue "Anything peculiar about this tape around o unfortunate friend's neck?" he asked, acade cally. "Yes," he answered himself. "What?" asked, and before Watts could answer, repli to himself: "Marks, gentlemen, marks! A what kind of marks?"

"Wait a minute!" yelled the Inspector. "I me answer for a change!" The police offic examined the tape, exclaimed: "Fingern marks — like, like — —"

"Precisely," said Snorlock. "Before the Cou expired, he fingernailed a code message on t tape. Note what the dots and dashes re gentlemen."

"Watts, who had passed a Novice exami tion after the tenth time, read the tape: 'T man who killed me is — —' "

"Go ahead," goaded Snorlock.

"I can't," said Watts, cringing. "That li of dialog always ends with a gunshot bef the name of the murderer is uttered."

"Nonsense," taunted Snorlock, who grabb the tape and spoke the name Figgsby Fop heimer. Simultaneously, a gunshot rang out a *boi-innged* on Snorlock's armor underwe "There's your murderer," said Snorlock to Inspector, as the bow-tied Figgsby dropped gun in impotent rage. "This case is closed," concluded, "Oh, yes, the motive. Suppose y tell us, Figgsby."

The half-hysterical Figgsby's words came a torrent. "I had to do it. I couldn't stand anymore. Here I had a kilowatt rig with 4-element beam on top of a 100-foot tower a I couldn't work any DX when the Count w on the air with those tantalizing CQ's."

"What was the line-up of the Count's ri asked Watts.

"You can see for yourself," screamed Figgs "A pair of *UX*-199's with loop modulation!"

Broad Band . . .

EDITOR, CQ:

I was quite interested in the QSL return percentages listed by W9HEX in your October 1953 issue. Below are my tabulated results for the period December 1947 to date.

	QSL's sent	QSL's recd.	W9HEX returns	WØKV returns
W1	62	69%	83%	low by 14%
W2	76	70%	77%	low by 7%
W3	58	62%	66%	low by 4%
W4	67	61%	76%	low by 15%
W5	86	64%	85%	low by 21%
W6	161	54%	75%	low by 21%
W7	82	70%	94%	low by 24%
W8	62	68%	56%	high by 12%
W9	60	63%	63%	same
WØ	244	57%	91%	low by 34%
Foreign	272	68%		
total	1230	63%	returns	

I am unable to explain why my returns run almost consistently lower than those of W9HEX, unless he has a somewhat more attractive QSL card. I would like to work him and see.

ROBERT R. BALLARD, WØKV
Denver, Colo.

EDITOR, CQ:

Noting W9HEX's percentages of QSL card returns in your October issue, I would like to submit the following figures on 508 SWL cards sent out.

W1	67% returns
W2	54% returns
W3	65% returns
W4	33% returns
W5	67% returns
W6	81% returns
W7	38% returns
W8	73% returns
W9	53% returns
WØ	50% returns

The average of my returns is 55% which I consider quite good as compared with 70% by W9HEX. Incidentally, of those cards, 82 were from YL's in the United States.

H. V. B. VOORHIS
Red Bank, N. J.

Numerous other tabulations were received from our readers, all of which seemed to run in about the same category of percentage of returns as WØKV. It would appear that the figures submitted by W9HEX (page 10, October, 1953, CQ) were exceptional. If anyone has a higher figure than W9HEX, it hasn't been reported to us as yet. It might be worthwhile to mention that Mr. Voorhis

(Continued on page 33)

Eimac crystal ball shows a very Merry Christmas and a Prosperous New Year in store for you!

From the Eimac Gang

K6AFL	W6DUW	W6MBK	W6RWI	W6TXT	W7SLC
KN6ANN	W6DVB	W6MUC	W6RXW	W6ZGV	
K6BJ	W6DWM	W6NBD	W6SC	W6ZLB	W1KKP
W6AY	W6FKS	W6NGP	W6UF	W6ZPH	W2CN
W6BAX	W6FXB	W6ODT	W6UFU	W6ZZL	W4TO
W6BET	W6HB	W6OMC	W6UOV	W6TVS	W6QD
W6BMU	W6HUB	W6ONQ	W6VQD	WN6SCZ	W6ENV
W6CBN	W6INJ	W6OS	W6VW	W6OHU	W9AIO
W6CEO	W6IUZ	W7SIF	W6VYH	W6YSX	W ØNWW
W6CHE	W6JFV	W6QIT	W6WC		W Ø RPE
W6DJI	W6KFQ	W6QQV	W6WSL		

Eimac TUBES

EITEL-McCULLOUGH, INC. SAN BRUNO CALIFORNIA

Versatile 70 Watts

ERNEST F. HISER, JR., W4OJX

Field Engineer, Bendix Radio Corp., Baltimore 4, Md.

This All-Band Transmitter Almost Exactly Duplicates a Field Day Design Prepared by the Editors of CQ. It is the Best Unit of its Type that We Have Seen in Quite Some Time. It Particularly Features Pre-Tuned Multiplier Stages and Miniature Tubes.

When a Ham has to move around a lot, a "big rig" is virtually impossible. The author learned this the hard way, by having to pack and crate, then uncrate and re-assemble a QRO transmitter. It seems that something always gets broken in such a deal, and the crating cost adds no additional encouragement to try a second move in like fashion.

After the last move, it was decided to build a small transmitter that would require little effort to move about, and one which would keep the shipping cost down. An outline of such a transmitter would include:

1. A minimum of 50 to 70 watts of power.
2. Size comparable to a receiver.
3. Frequency range of 3.5 Mc. to 29.7 Mc.
4. V-f-o operation on all bands.
5. Complete bandswitching. No plug-in coils!
6. The transmitter must work into a variety of antennas.
7. Phone operation must be possible, although of a secondary nature. Excessive space and weight for plate modulation is regretfully "out."
8. Modern design, TVI measures, miniature tubes—all a necessity.

General Design

A block design of the complete transmitter is shown in *Fig. 1*. An 80-meter v-f-o using a 6AG5 tube drives a 6AQ5 untuned buffer. This, in turn, drives three multiplier tubes (6AQ5's) which are switched in and out of the circuit as required. The p.a. is a 6146 tube, running with a plate voltage of 550, or an input of 70 watts on all bands. A *pi*-network is employed to couple the 6146 tube to any unbalanced antenna, or to an antenna tuning network.

A 6AQ5 tube *(V10)* is used as a clamp tube for c-w operation, or as a clamp modulator for phone operation. A 6AU6/6C4 combination provide sufficient gain for proper operation of a crystal mike. To achieve complete cut-off of the 6146 tube for c-w operation, an OA2 voltage regulator is employed to cut the screen supply to the 6146 when the 6AQ5 tube is conducting.

Two power supplies are needed, one for the r-f section high voltages, and the other for the various low voltage circuits. A 5R4 and a 6X4

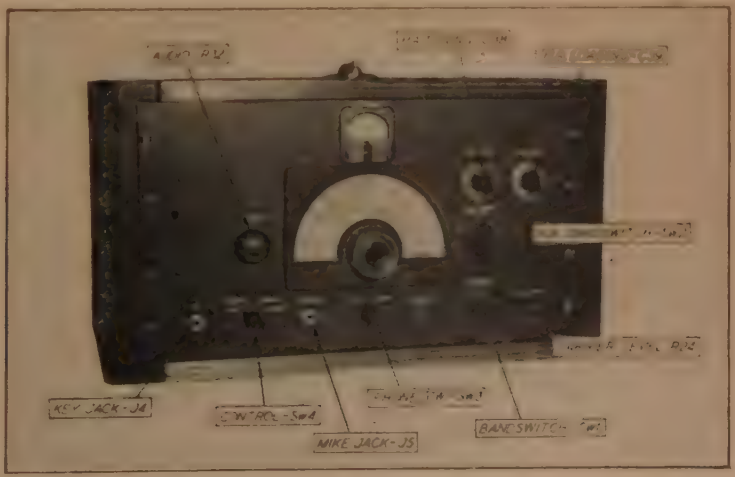


Fig. 3. Front panel view showing the positions of the principal controls. The meter is not switched, but is permanently inserted in the plate lead of the 6146 final amplifier.

are used, along with an OB2 regulator, for a total of 13 tubes in the transmitter.

General Layout of the Transmitter

General construction of the transmitter may be seen in the rear view photo *(Fig. 2)*. The power supply, the frequency multipliers and the 6146 p.a. are all mounted on the 10 x 17 x 3-inch aluminum chassis. The v-f-o unit, and the speech amplifier, however, are assembled separately on small sub-chassis that plug into receptacles mounted on the larger chassis. This construction provides superior shielding, and greatly simplified wiring techniques. The v-f-o may be wired and tested as a unit before it is connected to the transmitter, and both of these sub-assemblies may be completely assembled without having to wrestle the main chassis.

The p-a tank circuit is mounted on a special bracket shown in the left background of *Fig. 2* and the 6AQ5 modulator tube and OA2 series control tube *(V9)* are mounted between this bracket and the front panel. The controls of *C38, C39* are coupled to their dials by short lengths of ¼" brass rod which pass through panel bushings.

A bottom view of the transmitter is shown in *Fig. 4*. *C48* and *T3* are mounted in the lower left of the chassis. The doubler circuits are to the center, right, and the antenna relay, *Rl2*, is mounted on the back edge of the chassis. Notice that all long lengths of wire are run in neat cables. Although this cabling is not a prerequisite to operating the transmitter it does make a neater appearance.

The receiver disabling relay *Rl1*, is mounted on the back edge of the chassis (bottom of photo) and is connected to the two prong male plug mounted adjacent to it.

Transmitter Construction

The V-F-O

The v-f-o *(V1)* and buffer stage *(V2)* are constructed as a plug-in unit in a 2 x 3 x 5-inch aluminum box *(Minibox #48-7)*. A 6-prong *Jones* plug, *Pl1*, is mounted on the bottom of the box and is used to supply all of the voltages necessary to operate these two stages, as well as furnishing the keying lead and the r-f output lead. The schematic of the v-f-o unit is shown in *Fig. 5*, and an interior view is shown in *Fig. 6*.

When the v-f-o unit is plugged into place, it is secured by two *6-32* bolts which protrude underneath the box about ¼". These bolts pass through matching holes drilled in the large aluminum chassis, and are then capped with lock-nuts, which hold the v-f-o firmly in place. Thus the v-f-o may be removed from the transmitter for calibration or servicing by removing the lock-nuts and the flexible coupling to the *National ICN* dial.

A 6AG5 *(V1)* is an excellent performer in the *Clapp* oscillator circuit, and oscillates smoothly over the tuning range of 3.4-4.1 Mc. The untuned plate circuit of the 6AG5 is capacity coupled to the 6AQ5 buffer *(V2)*.

The only critical component in the v-f-o unit is the coil *(L1)* for the Clapp circuit. It must be of high *Q* construction, and reasonably sturdy. A *National XR-1* form may be used, and the windings wound tightly on to the form, and coated with polyethylene cement. The coil should be mounted solidly to the chassis-box. The tuning capacitor *(C1)* should be of the double bearing type. This will prevent much of the back-lash found when a single bearing condenser is used in the Clapp circuit. A *Bud MC-1853* is used in this transmitter. One

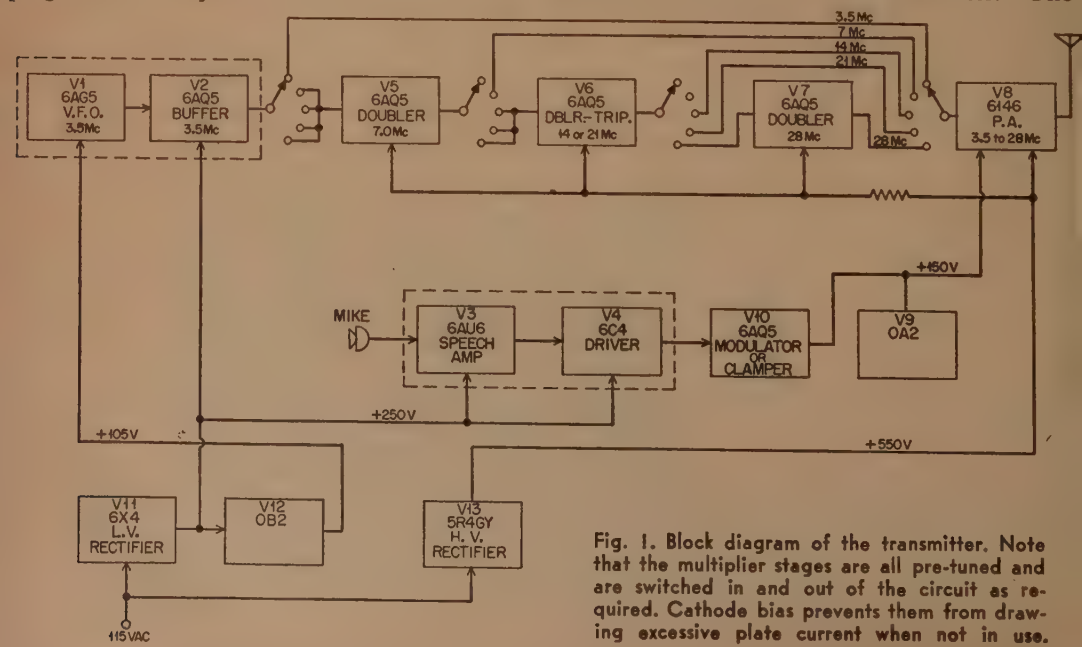


Fig. 1. Block diagram of the transmitter. Note that the multiplier stages are all pre-tuned and are switched in and out of the circuit as required. Cathode bias prevents them from drawing excessive plate current when not in use.

Fig. 2. Rear view with important components labelled for identification. The send/receive relay is mounted on the rear skirt of the main chassis.

stator plate was later removed from this condenser to give the desired frequency range. The band-set condenser, *C2*, is mounted so that the slotted shaft is easily accessible from the top of the unit.

To prevent "ride-through" of the oscillator when break-in operation is used, both the oscillator and buffer are keyed.

Condensers *C13*, *C14*, *C15*, *C16* and *C16A* on the power leads are 100 $\mu\mu$fd. disc ceramicons which effectively prevent radiation of r.f. from the leads passing through the power plug *P11*.

The slug-tuned plate coil, *L2*, for the 6AQ5 buffer is wound on a *National XR-50* coil form, and is resonated to 80 meters by *C10*, a 47-$\mu\mu$fd. ceramic condenser. Also in parallel with the coil and condenser is a 10,000-ohm loading resistor, *R5*. This is used to keep the grid drive to the 6146 p-a stage at fairly constant level across the entire 80-meter band.

The power requirement for the 6AG5 oscillator is 105 volts at 5 ma. This voltage is obtained from the low-voltage supply, regulated by a OB2 miniature regulator tube *(V12)*. The 6AQ5 buffer is powered from the same supply and requires 18 ma. at 250 volts.

The output of the oscillator unit is coupled to the frequency multipliers through *C12* and *pin 2* of *P11*.

Frequency Multipliers

The three frequency multipliers provide excitation for the 6146 p-a stage on all bands higher than 80 meters. On 80 meters, the first position of switch *S1a* shunts the excitation from the v-f-o unit around the multipliers, directly to the grid of the 6146. The first doubler *(V5)* is broadly tuned to 7 Mc. by coil *L3*, which resonates with the distributed capacities of the circuit. When switch *S1* is set to the second position (40 meters) the output of *V5* is coupled to the 6146 stage. When *S1* is in the third position (20 meters) *V5* is capacity coupled to *V6*, the 20-meter doubler, which, in turn, is coupled to the 6146 by *S1D*.

Doubler *V7* is broadly tuned to 10 meters, and is only used for that band (switch *position 5*). For 15 meters, *V6* acts as a tripler, tuned to 21 Mc. by *L5*. Thus, switch *S1* selects the proper multiplier tubes and funnels the correct frequency to the grid circuit of the 6146 tube.

Cathode bias is used on all multiplier stages, and when they are not operating, the plate currents drop to a low value, so that the plate dissipation of the 6AQ5 tubes is not exceeded.

The doubler coils *(L3-L6)* are wound on *Millen #74001* shielded plug-in coil forms. The shield and slug of the coil are grounded by base *pins 1* and *2* of the coil form. Since these circuits will tune fairly broadly, no manual tuning of these stages is necessary during operation of the transmitter. In the initial alignment of the multipliers, *L3* is tuned to 7.2 Mc., *L4* is tuned to 14.4 Mc., *L5* is tuned to 21.2 Mc., and *L6* is tuned to 28.8 Mc.

Voltage for the frequency multipliers is obtained through a voltage divider in the high voltage power supply *(R25)* shown in *Fig. 8*. The total current drain for the multipliers is about 55 ma., each tube requiring about 18 ma. total cathode current. *R25* is adjusted for 275 volts when *S1* is in the 10-meter position.

The plate, screen and cathode by-pass condensers for the doubler stages are compact disc ceramics and should be mounted directly on each socket with very short leads. The screen resistors are 1-watt composition units, and mount directly between the 6AQ5 sockets and the *Millen* coil sockets. The coil sockets are mounted adjacent to the three gang switch, *S1 (Fig. 4)* and coupling condensers *C25*, *C29* and *C33* are supported by their leads between the sockets and the switch decks.

Each 6AQ5 filament lead is bypassed at the socket with a .001 μfd. disc ceramic condenser, and the main lead from the filament circuit to *T3 (lead A)* is run in shielded wire. The B plus lead *(wire B, Fig. 7)* to *R25* should also be made of shielded wire.

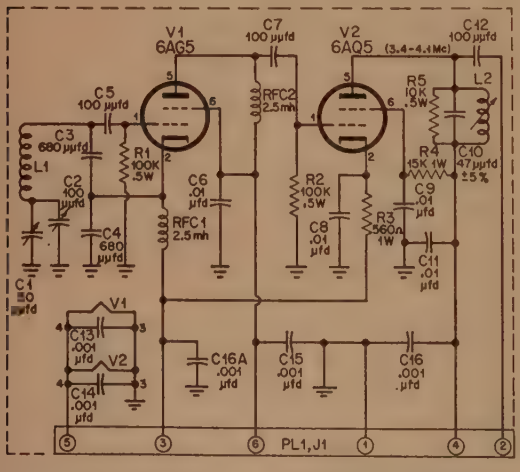
The Final Amplifier

The 6146 p-a socket is mounted directly behind switch section *S1e*, so that the grid lead may be made very short. *RFC3* is a base-mounting choke *(National R-100U)* and is mounted on the rear wall of the chassis, projecting towards the 6146 socket. *Pins 1, 2, 4, 6,* and *8* of the 6146 are grounded by short, heavy leads to the chassis. *C45* mounts between *pins 7* and *8*. *C34* mounts between *pins 3* and *4*. The filament lead to *pin 7* is made of shielded wire, and runs to a common tie-point, from which the filament leads for the doubler tubes branches off. This tie-point is mounted just to the left of the doubler tubes in *Fig. 4*.

R22 and *C40* are mounted on the rear wall of the chassis, next to *RFC3*. The lead from the "hot" end of *R22* to switch section *S3c* should be made of shielded wire, the shield grounded at both ends of the wire.

A small parasitic suppressor, *PC*, is needed in in the plate lead of the 6146 to suppress a parasitic oscillation that develops in the v-h-f region. It is mounted by its leads between *C35* and *C38*.

The plate coil of the 6146, *L7*, is a section of a *B & W Miniductor #3900* and is mounted directly to the contacts of *S2* by short leads made



C1—50 μμfd., variable (see text).
C2—100 μμfd., midget variable.
C3, C4—680 μμfd., silvered mica.
C5—100 μμfd., silvered mica.
C6, C8, C9, C11—0.01 μfd., disc HiCap.
C7, C12—100 μμfd., ceramic.
C10—47 μμfd., ceramic, ±5%.
C13, C14, C15, C16, C16a—0.001 μfd., disc Centralab Hi-Kaps.
J1—6-prong Jones socket.
PL1—6-prong Jones plug.
R1, R2—100,000 ohms, ½w.
R3—560 ohms, 1w.
R4—15,000 ohms, 1w.
R5—10,000 ohms, ½w.
RFC1, RFC2—2.5 mh., r-f choke.

Fig. 5. Wiring schematic and parts list of the plug-in v-f-o unit.

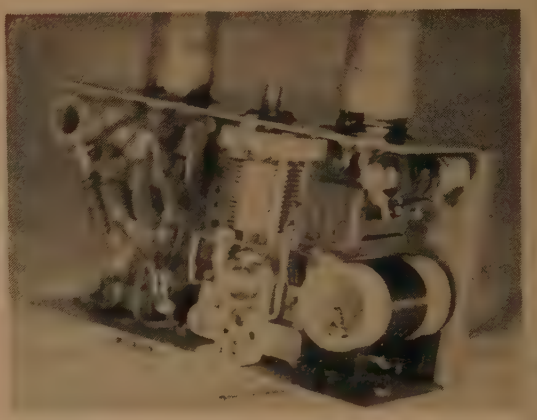


Fig. 6. Under chassis view of the v-f-o unit.

of #14 tinned copper wire. The tank circuit is mounted on a small bracket cut from a piece of soft dural *(Fig. 9)*. The output lead from *C39* passes through an insulating grommet in the chassis to *J3*, a coaxial plug mounted on the rear wall of the chassis.

The Clamp Tube

A 6AQ5 is used as a clamp tube for c-w operation and as a screen modulator for phone operation. *(V10, Fig. 7)* Grid-leak bias is thus sufficient for both phone and c-w operation of the 6146. However, if the plate voltage of the 6146 is higher than 500 volts, special precautions must be taken to keep the plate dissipation of the 6146 within limits, as this tube has a very low impedance screen circuit, and is not easy to "clamp." The 6AQ5 tube has quite high internal impedance, even when fully conducting, and cannot completely clamp the 6146 screen when the plate voltage on the 6146 is high. Therefore an OA2 is connected in series with the screen supply when *S3* is in the "CW" position. When the clamp tube operates, its plate voltage is lowered sufficiently to extinguish the OA2, and the 6146 screen voltage drops to zero, even though there is still some 50 volts or so on the plate of the clamper tube. Under these conditions, the plate current of the 6146 is only 15 ma. when the key is up, and the plate dissipation is within safe limits, even with 750 volts on the 6146.

Phone Operation

When *S3* is thrown to the "phone" position, the 6AQ5 clamper tube is changed to a clamp-modulator tube, and the OA2 is removed from the circuit. *S3a* adds cathode bias to the 6AQ5, *S3c* removes the clamper circuit, and connects the grid of the 6AQ5 to the speech amplifier, *S3b* removes the OA2, and *S3d (Fig. 8)* shorts the keying circuit to ground. Wiring of this circuit is straightforward, and no shielded leads are used.

The Speech Amplifier

The speech amplifier *(Fig. 10)* is constructed in a *Minibox* in the same manner as the v-f-o.

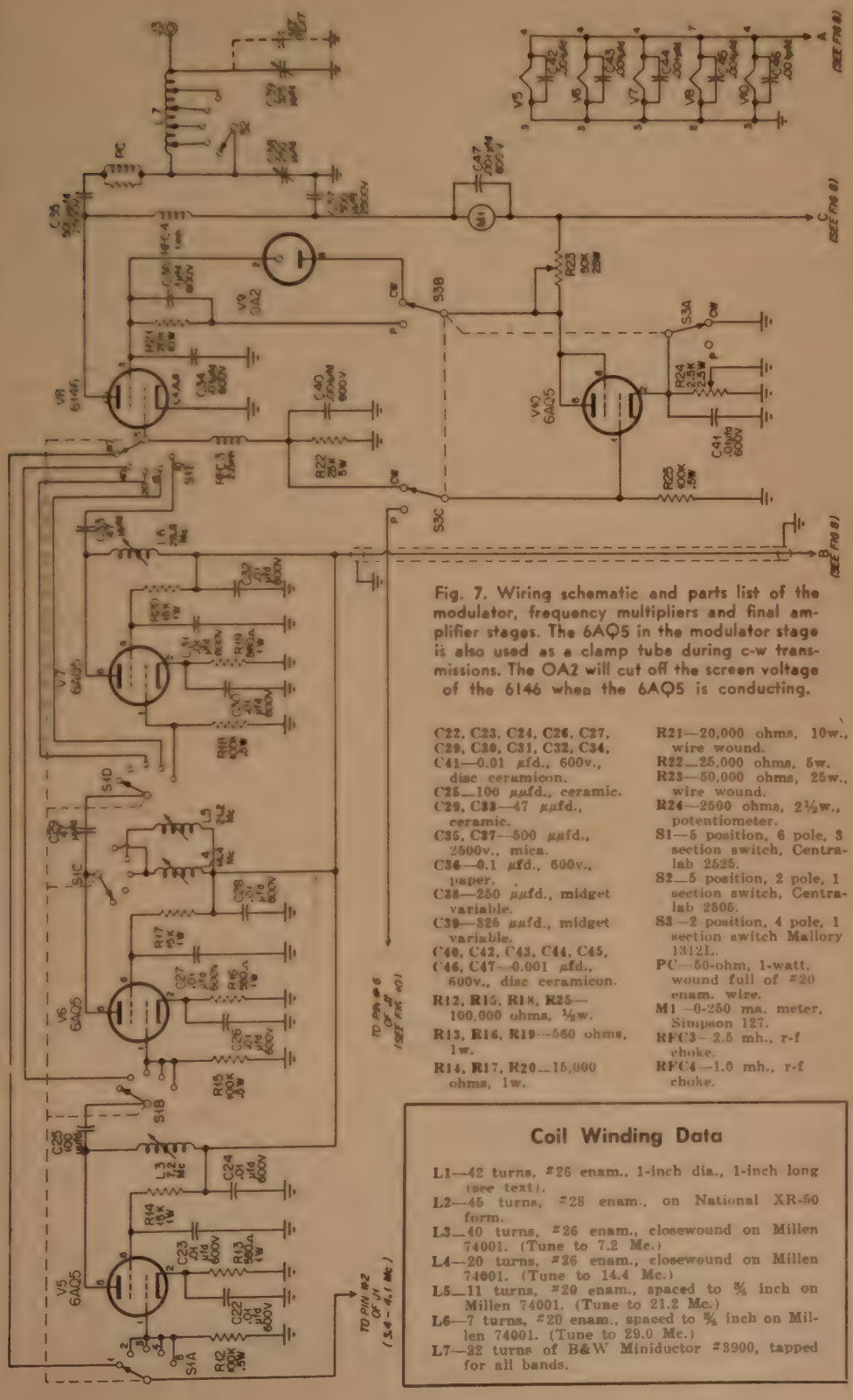
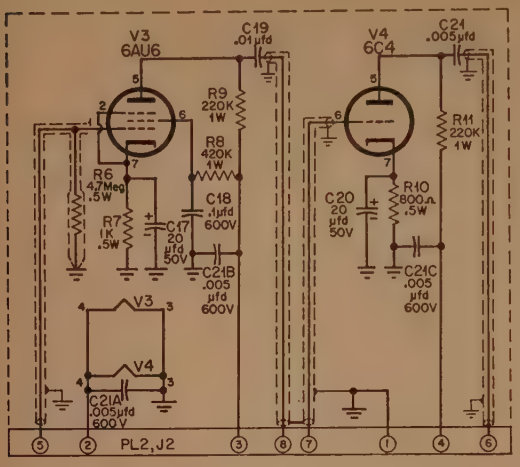


Fig. 7. Wiring schematic and parts list of the modulator, frequency multipliers and final amplifier stages. The 6AQ5 in the modulator stage is also used as a clamp tube during c-w transmissions. The OA2 will cut off the screen voltage of the 6146 when the 6AQ5 is conducting.

C22, C23, C24, C26, C27, C29, C30, C31, C32, C34, C41—0.01 μfd., 600v., disc ceramicon.
C25—100 μμfd., ceramic.
C29, C33—47 μμfd., ceramic.
C35, C37—500 μμfd., 2500v., mica.
C36—0.1 μfd., 600v., paper.
C38—250 μμfd., midget variable.
C39—325 μμfd., midget variable.
C40, C42, C43, C44, C45, C46, C47—0.001 μfd., 600v., disc ceramicon.
R12, R15, R18, R25—100,000 ohms, ½w.
R13, R16, R19—560 ohms, 1w.
R14, R17, R20—15,000 ohms, 1w.
R21—20,000 ohms, 10w., wire wound.
R22—25,000 ohms, 5w.
R23—50,000 ohms, 25w., wire wound.
R24—2500 ohms, 2½w., potentiometer.
S1—5 position, 6 pole, 3 section switch, Centralab 2525.
S2—5 position, 2 pole, 1 section switch, Centralab 2506.
S3—2 position, 4 pole, 1 section switch Mallory 1312L.
PC—50-ohm, 1-watt, wound full of #20 enam. wire.
M1—0-250 ma. meter, Simpson 127.
RFC3—2.5 mh., r-f choke.
RFC4—1.0 mh., r-f choke.

Coil Winding Data

L1—42 turns, #26 enam., 1-inch dia., 1-inch long (see text).
L2—45 turns, #28 enam., on National XR-50 form.
L3—40 turns, #26 enam., closewound on Millen 74001. (Tune to 7.2 Mc.)
L4—20 turns, #26 enam., closewound on Millen 74001. (Tune to 14.4 Mc.)
L5—11 turns, #20 enam., spaced to ¾ inch on Millen 74001. (Tune to 21.2 Mc.)
L6—7 turns, #20 enam., spaced to ¾ inch on Millen 74001. (Tune to 29.0 Mc.)
L7—32 turns of B&W Miniductor #3900, tapped for all bands.



C17, C20—20 μfd., 50v.
C18—0.1 μfd., 600v.
C19—0.01 μfd., 600v.
C21, C21a, C21b, C21c,—0.005 μfd., 600v., ceramicons.
J2—octal socket.
PL2—8-prong plug.
R6—4.7 megohm, ½w.
R7—1000 ohms, ½w.
R8—420,000 ohms, 1w.
R9, R11—220,000 ohms, 1w.
R10—800 ohms, ½w.

Fig. 10. Speech amplifier wiring schematic.

The box measures 1½ x 2 x 4-inches *(Minibox #48-3)*. This type of construction minimizes feedback into the audio circuits from the r-f circuits. An eight-prong octal plug is mounted on the bottom of the box and plugs into a regular octal tube socket mounted on the transmitter chassis. Two *6-32* bolts hold this sub-assembly in position, as in the case of the v-f-o unit. All power, microphone, audio and gain control leads are fed by this plug to the transmitter proper. *Leads 5, 8, 7* and *6* are shielded, with the shields grounded at both ends.

A 6AU6 *(V3)* is used as the speech-amplifier, and a 6C4 *(V4)* is used as the driver for the 6AQ5 modulator. An external gain control, *R32-Fig. 8,* is connected between *V3* and *V4* through *pins 7* and *8* of *Pl2*.

The Power Supplies

Two power supplies are used in this transmitter. The low voltage supply *(Fig. 8)* uses a miniature 6X4 tube and furnishes regulated voltage to the v-f-o *(pin 6, J1)* 250 volts to the untuned buffer *(pin 4, J1)* and 220 volts to the speech amplifier *(pin 3, J2)*. The 5-volt winding of this transformer is used for the 5R4 high voltage rectifier, *V11*.

A high voltage "on" indicator of the "blinking" type is used *(I2, C49, R31)* since this type is more easily noticed than a straight light.

Switch *S4,* a four-position rotary wafer deck, switches primary voltages to the supplies in the following sequence:

Switch position 1—OFF.

Switch position 2—CALIBRATE. Voltage applied to all the filaments, and to the low voltage supply. The keying circuit is closed by *S4c*.

Switch position 3—STANDBY. Short across key is opened, allowing no oscillator "feed-thru" to receiver.

Switch position 4—TRANSMIT. High voltage applied to 6146, as *T1* is energized.

The primary circuit of the transmitter is fused by *F1,* and both sides of the 117-volt line should be bypassed with coaxial-type condensers to prevent harmonic energy from flowing down the power line to a nearby TV set.

General Construction and Layout

The panel layout of the transmitter is shown in *Fig. 3*. The layout is essentially symmetrical, which makes a neat and well-planned appearance. The front panel is a standard ⅛" aluminum rack panel, 10½" high. The cabinet used to house the transmitter is a *Bud CR-1740*.

In areas of strong television signals, only a low-pass filter on the output of the transmitter is necessary for TVI-proof operation. In areas of weak signals, it may be necessary to seal the cabinet against harmonic leakage, employing the techniques outlined by W6SAI.[1]

Decals may be applied to the panel for identification of the various controls, and before final assembly, the paint should be cleaned from the back of the panel where it makes contact with the transmitter chassis *and* with the cabinet. Two self-tapping screws should be run through the bottom of the cabinet into the rear lip of the chassis to effectively ground the read edge of the chassis to the cabinet.

As a final step, the scale of the *National* dial should be accurately calibrated for each band, and the calibrating lines marked on the scale with India Ink.

1. Orr, "The Collins 310B—1953 Version," CQ, June 1953, p. 13.

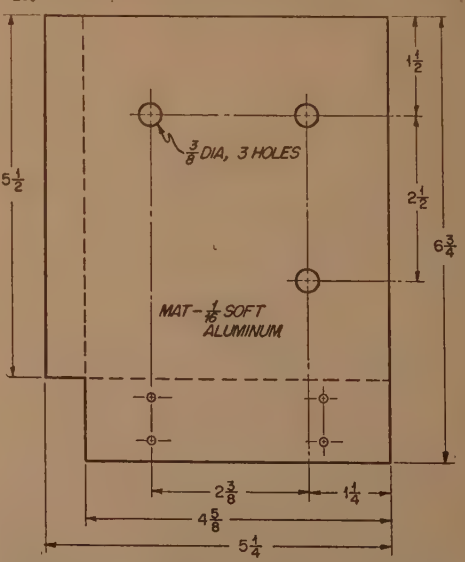
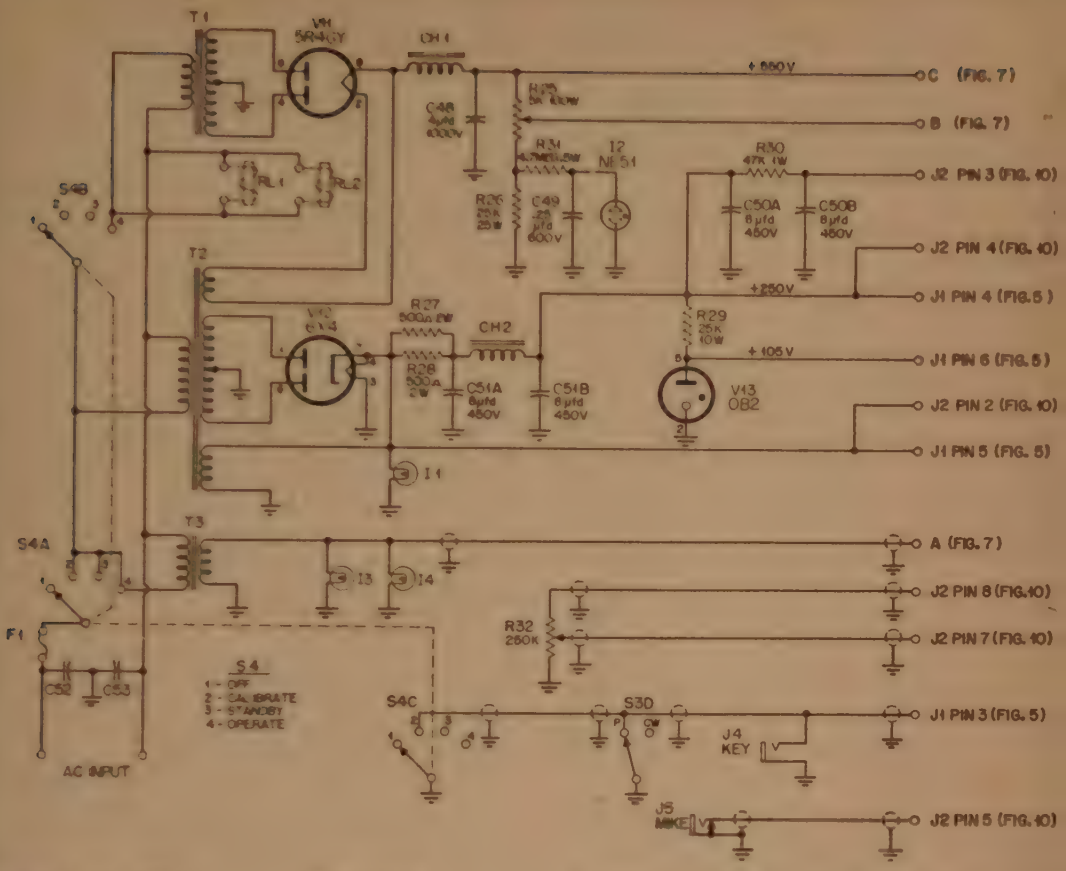


Fig. 9. This bracket is used to mount the final tank circuit. It may be cut from dural or soft aluminum to the size shown.



C48—4.0 µfd., 1000v., oil filled.
C49—0.25 µfd., 600v., paper.
C50a, C50b, C51a, C51b, dual 8 µfd., 450v., electrolytic.
C52, C53—0.001 µfd., 600v., Bypass.
Ch1—7.0 hy., 300 ma., Thordarson T-20C16.
Ch2—7.4 hy., 100 ma., Stancor C-1421.
I1, I2, I3, I4—Dial light bulb, type 44.
I2—Neon bulb, type Ne-51.
J4—Open circuit jack.
J5—Closed circuit jack.
R25—5000 ohms, 100w., wire wound.
R26—25,000 ohms, 25w., wire wound.
R27, R28—500 ohms, 2w.
R29—25,000 ohms, 10w., wire wound.
R30—47,000 ohms, 1w.
R31—4.7 megohm, ½w.
R32—250,000-ohm, potentiometer.
RL1—Receiver disabling relay.
RL2—Antenna change-over relay.
T1—660-0-660v., 250 ma., Merit P-3157.
T2—300-0-300v., 70 ma.; 5v, 2.0 amp.; 6.3v, 3.0 amp., Thordarson T22R02.
T3—6.3v, c.t., 3.0 amp., Merit P-2946.
S4—4 position, 3 pole, 2 section, wafer switch.

Fig. 8. Wiring schematic and parts list of the power supplies.

Tune-up Procedures

1. After the transmitter has been completed and the wiring carefully checked, the 6AG5 v-f-o tube *(V1)*, the 6X4 rectifier *(V12)* and voltage regulator *V13* should be inserted in their respective sockets, and switch *S4* set to *position 2*. A signal from the v-f-o should be heard in a nearby receiver, tuned to 80 meters. Padding condenser *C2* should be adjusted that the range of 3.4-4.1 Mc. appears across the main tuning dial.

2. Power should be turned off, and the tap on *R25* set about one-quarter of the way down the resistor from the "hot" end. The 5R4 *(V11)* should be plugged in the socket, the doubler tubes *V5*, *V6* and *V7* placed in their sockets. The 6146 is placed in its socket, and the lead to *R23* from the B plus supply *temporarily opened*, removing screen voltage from the 6146. *S1* is set to 80 meters, and a high resistance voltmeter is connected across *R22*. The positive terminal of the meter is grounded. A key is inserted in the key jack, *J4*; and *S4* turned to *position 2*. After the tubes have had time to warm up, *S4* is turned to *position 4*, applying voltage to the doublers and the plate of the 6146.

The plate circuit of *V2 (L2-C10)* is resonated for maximum reading of the voltmeter, when the v-f-o is tuned to 3.7 Mc. A reading of over 50 volts should be obtained at any point in the 80-meter band when this adjustment is completed.

3. Switch *S1* should be advanced, and the succeeding doubler stages resonated near the centers of each band. Again, a reading of 50 volts or so on the meter should be achieved. This will result in a grid current of 1.8 to 2.6 ma. which is sufficient for proper operation of the 6146.

4. When the exciter stages have been resonated properly, the screen supply of the 6146 may be re-connected, the clamp tube *(V10)* and the series regulator *(V9)* placed in their sockets, and *S3* placed in the "CW" position. The transmitter should be connected to a dummy antenna, and the 6146 stage partially loaded up. *R23* should then be adjusted for an operating screen voltage of 150 volts, under actual operating conditions. The 6146 may be loaded to 150 ma. of plate current for c-w operation, representing an input of about 80 watts. *R25* is adjusted for a potential of 275 volts at the tap when *S1* is on *position 5*.

Phone Tune-up

After the transmitter has been found to operate properly on c-w, it should be tested on phone. The speech amplifier tubes, *V3* and *V4* should be plugged in, and a microphone connected to *J5*. Switch *S3* is set in the "phone" position, and the voltage at the screen of the 6146 is adjusted to 75 volts (one-half of the c-w rating) by varying the cathode resistor *(R24)* of the 6AQ5 clamper tube. Because of the voltage drop across *R21*, the actual plate voltage on the clamper tube is about 100 volts. Condenser *C36* allows 100% screen modulation of the 6146, a condition not too readily found with simpler clamp-tube modulators. The plate current of the 6146 should run about 75 ma. under these operating conditions. After initial adjustments, only slight changes in *R24* will be necessary after changing bands, or a quick QSY across a phone band. The transmitter should *always* be first tuned for c-w operation, then switched to phone operation, and *R24* adjusted so that the 6146 draws 75 ma. without any change in antenna loading. This will insure the correct parameters for 100% linear modulation.

When the 6146 is properly adjusted, the plate current should not change with 100% modulation. If the current kicks slightly upwards, however, it indicates that the system is operating properly. But if the plate current should drop slightly with heavy modulation, it indicates the resistance setting of *R21* (the screen dropping resistor) is too high, and should be lowered a bit. Too much resistance in *R21* (assuming that a constant 75 volts is held on the screen of the 6146 by varying *R24*) allows too much voltage on the plate of the 6AQ5, which then ceases to operate class A. The resulting distortion and TVI is terrific! Once *R21* and *R24* are set to the desired values, the operation of the transmitter is fool-proof.

It is amazing to find that when you finish constructing a transmitter or any piece of gear, it never seems as neat as was visualized when the chassis was new and the layout of parts was started. This transmitter is no exception. Any time a lot of parts are mounted in a small space, neatness seems to fly out the window. There is, however, a way to make the jumbled mass of wires and parts more eye-appealing. First, the wires must be kept closely together in bundles, so that laced cables can be made for the longer wire runs. This cabling can even be carried to r-f wiring to some extent, if coaxial cable can be used for the r-f leads. Secondly, as many of the parts as possible should "line up" in the same direction, either parallel or at right angles to the front edge of the chassis. These are two methods which help make the rig look neater, and also help you to get more parts into a smaller space.

The writer has spent many pleasant hours operating this transmitter, and has had many fine QSO's. It is not expected that anyone would wish to copy the design exactly, but perhaps it may provide a few ideas which can be useful to the Ham who moves around a lot, or to the Ham who does not have enough space for the "big rig."

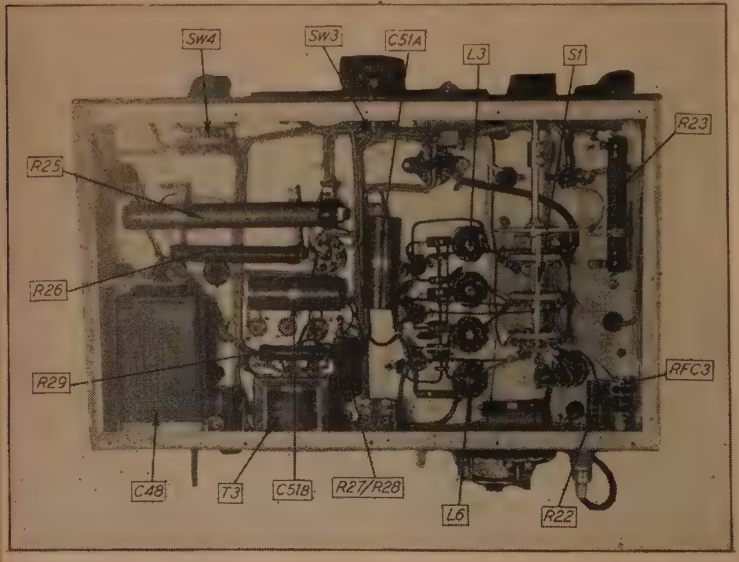


Fig. 4. Bottom view of the W4OJX transmitter designed for versatility using pre-tuned multiplier stages and a 6146 in the output. Millen shielded plug-in coils are used in the vertical row of tube sockets between L3 and L6.

Test Equipment..... ... in the Ham Shack

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Tube Checkers

This is the first article in a new series on a subject which we feel has never been thoroughly covered in the amateur radio literature. Subsequent articles will be devoted to audio signal generators, signal tracers, oscilloscopes, etc. The end product of this series is the desire to demonstrate the use and construction of test equipment, its time saving valuable features and opening of new experimental frontiers for the Ham—Managing Editor.

In the early years of Ham radio, in the days of spider web coils and 210 tubes, at least two pieces of test equipment were found in the well-equipped Ham shack. These were a wave meter and a small incandescent bulb, the bulb usually soldered to a one-turn coil or perhaps in the antenna lead.

The years that have passed since then have seen much water and many defunct tubes go under the bridge, and amateur radio has made great progress . . . we now get along without the wave meter. Many of the fraternity even have two or three flashlight bulbs!

Perhaps the test-equipment situation is not as black as we have painted it. But after visiting with a number of Hams one comes to the conclusion that many stations are being operated with less than the bare minimum of test equipment. Perhaps many reasons contribute to this condition. To many, and especially the newcomers, test equipment means expensive units and complicated circuits. Others hesitate because they are not sure of the capabilities or limitations of a certain piece, and still another group would prefer to construct their own because of the prohibitive cost of commercial units.

During this series we will attempt to outline the normal use and potentialities of several pieces of measuring equipment. These are units which, though at one time considered a luxury, have become necessities in the modern Ham shack. We hope that the information will aid in the selection and use of suitable instruments for many, and that those who build their own use it as a starting point for their design.

There are some who prefer to build, but either do not have the time or tools to build from the ground up. For this group some of the commercially available kits have been tested in our own shop. The performance data and

". . . two pieces of test equipment in the well-equipped shack . . ."

mechanical details will be given on a number of those which have been found to be satisfactory for our purpose.

It should be stressed that the suggested circuits and methods have been chosen with a balance between precision and cost.

One instrument which every Ham station needs, few own, and even fewer have attempted to build, is a tube tester, an up-to-date model which will handle the great variety of tubes in the receiving and low-power category. There is probably no other instrument that becomes obsolete as quickly as a tube tester. However, if the design is kept simple it can be modified for future tubes with little effort.

Ways of Testing a Tube

There are many ways to test a tube, each with its own advantages. One such test regarded very highly by many is the power output test. In this the tube is placed in a circuit with all voltages similar to those that will be used in actual operation. When a signal of known value is placed on the grid, the a-c plate current developed in a load resistor is measured. From this the power output is determined. In the case of a voltage amplifier the power output will indicate the amplification and voltage output which can be obtained. It can be seen that this type of tester will require more parts than a good many Ham rigs contain. This puts it in the price range of a good receiver. Needless to say, for the budget-wise Ham this eliminates it from our discussion.

Another method which has met with considerable favor is the measurement of mutual conductance. This makes use of the fact that in a given tube type a known change in grid voltage will produce a specified change in plate current. The tube being tested is then judged *good* or *bad* by the amount of plate current change compared with that of a known good tube. Changing of the grid voltage is accomplished many times by applying an a-c voltage to that element. When this is done there is an a-c component to the plate current which is determined by the mutual conductance of the tube and can be read as mutual conductance on an a-c meter. In this type of test, normal operating voltages are applied to the elements. This test will give a good indication of a tube's worth but many times does not give a true picture of the tube's emission capabilities. An unusually good reading can mean that the tube is gassy but the opposite can also be true. In tubes of high current rating such as the 6AS7 the meter will sometimes indicate a normal tube but after 15 seconds or more will start a gradual decline which can be mistaken for falling emission. This has many times been found to be runaway emission instead, the grid having lost control. A tube deviating more than plus or minus 20% should be viewed with suspicion unless an operating check proves it to be O.K. In most cases this tester too is priced out of the reach of many Hams and is difficult to complete as a home project.

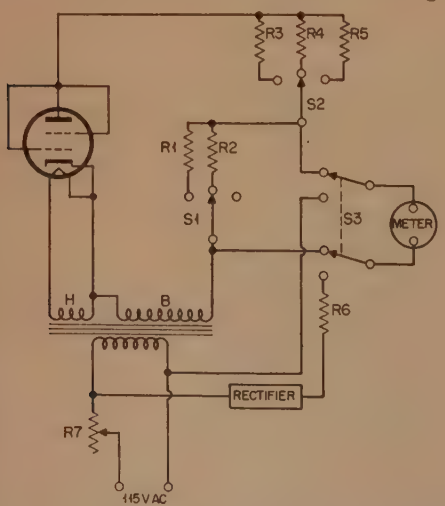


Fig. 1. Basic circuit of the emission type tube checker. Note that the grids ar all tied to the plate and the tube is operated as simple diode. The capability of the tube is then measured by the meter in the plate circuit.

The Emission Type Checker

A third check which may be given a tube is the emission check. While this method does not give as much information about a tube as does either of the first named, it is the most logical choice for a low cost instrument. In this test the tube is connected as a diode, this being accomplished by connecting all of the grids to the plate. A positive voltage is applied to the plate. A milliammeter in the plate circuit will then indicate the emission capability of the cathode or filament as the case may be.

Shown in *Fig. 1* is the basic circuit of such a checker. Plate voltage B is usually furnished from a winding on the same transformer, the positive half cycles causing the meter to indicate. A switch, *S2*, is usually used to insert dropping resistors in the *B* supply. These are to limit the current. Certain tubes with high plate resistance will require full voltage. Others with low resistance would pass damaging current without a limiting resistance. Switch *S1* is used to vary the range of the milliammeter by shunting it.

To insure correct readings voltages *H* and *B* must be set to the correct value each time the instrument is used. The meter *M* can double as a line voltage meter to set the primary voltage of the transformer each time. This eliminates errors due to fluctuating line voltage. To do this *S3* places the meter in a rectifier circuit across one of the windings of the transformer and *R7* is positioned to bring the meter to a reference point.

In an instrument of this sort the meter is usually marked off with the upper 40% of the scale designated as "GOOD," the lower 40% as "BAD," and the middle 20% as "DOUBTFUL." To calibrate such a tester a known good tube

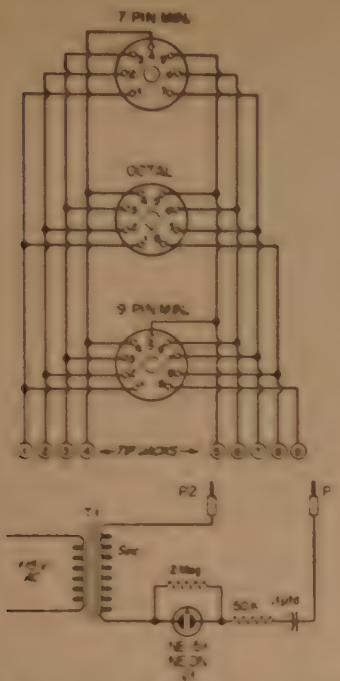


Fig. 2. Simple "short" checker constructed from junk box parts.

is placed in the proper socket and rated filament voltage applied. With the elements connected as a diode as shown in *Fig. 1* the series resistors and meter shunts are adjusted to give a reading in the "GOOD" portion of the scale. The resistor settings are then noted for future use on this type of tube.

If a known good tube of the type desired is not available for calibration purposes, many times a similar tube can be substituted with equally good results. For example, any one of the following tubes can be used to set up calibration values for all of the other tubes in the list, providing proper pin connections are taken into account.

6J5	6L5	12AU7	6SN7	5692
6N4	12J5	12AT7	5963	7N7

With a little study of the tube manual even more could be added to this list.

How to Use a Tube Checker

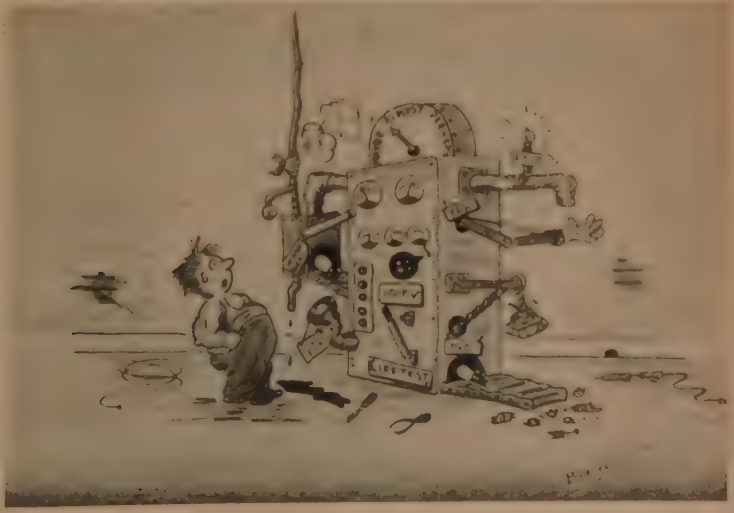
Although limited in some respects a checker of this type can give very good results if the user is familiar with his instrument. Assuming that an emission-type checker is correctly set up to test a certain tube, watch for the following indications.

1. Of course the meter should read in "GOOD" portion of scale; if meter reads low the tube should be discarded. If meter reads too high the tube should be suspected of being gassy or otherwise defective.

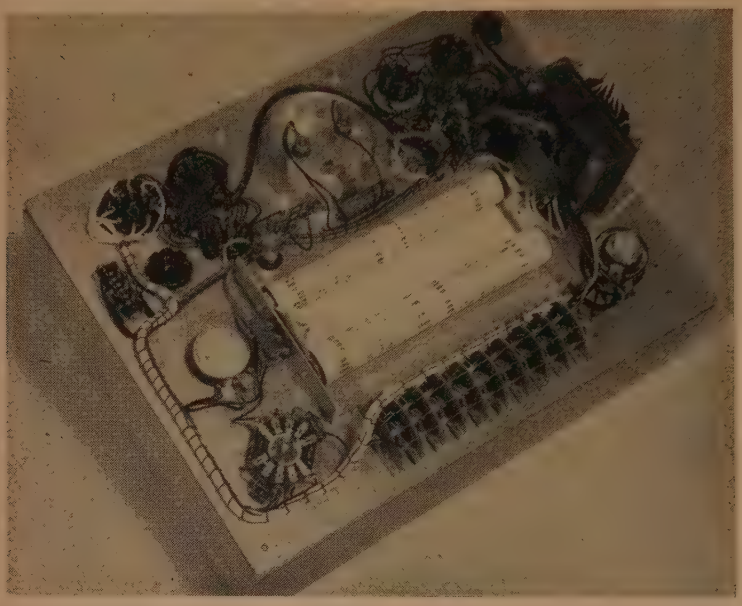
2. If tube reads "GOOD" but after a few seconds or minutes in "TEST" position meter begins to climb again, this indicates a tube which breaks down under heat or current and is probably gassy.

3. If tube reads "GOOD" but after a few minutes in "TEST" position, the meter reading begins to fall, this tube has low or failing emission. It perhaps would work in a low current circuit such as a voltage amplifier for some time but will not hold up under sustained medium current drain. It too should be discarded.

4. On tubes with 5-volt, 6.3-volt or 7.5 volt heaters, an indication of life expectancy can be had by dropping the filament voltage to the first tap below the normal one. If the meter drops off severely the tube is near the end of its useful life. Example: After testing a 6V6 which indicates "GOOD," the filament is dropped to 5 volts. If meter drops off rapidly tube



"... there are certain practical limitations in every type of tube checker ..."



This is a bottom view of the Heathkit Model TC1 tube checker showing the wiring to the switches and the mounting of the roller chart.

is nearing the end of useful life.

5. Occasionally an element will become open in a tube. If one element at a time is disconnected from those forming the plate of the diode circuit the meter should react as each one is removed. Any element, the removal of which has no effect upon the meter current, is probably open.

All tube checkers should incorporate a good check for shorts. This one test will probably find as many bad tubes as any other checks given. Many tubes which give intermittent or noisy operation will show up as shorted or leaky. Cathode to heater leakage can be especially annoying in speech or high gain stages. For many r.f. applications, such as in the VFO, a cathode-to-heater leak can ruin an otherwise good note. To be so valuable a check, the short indicating portion is very simple. In most cases it consists of a neon bulb which can be inserted

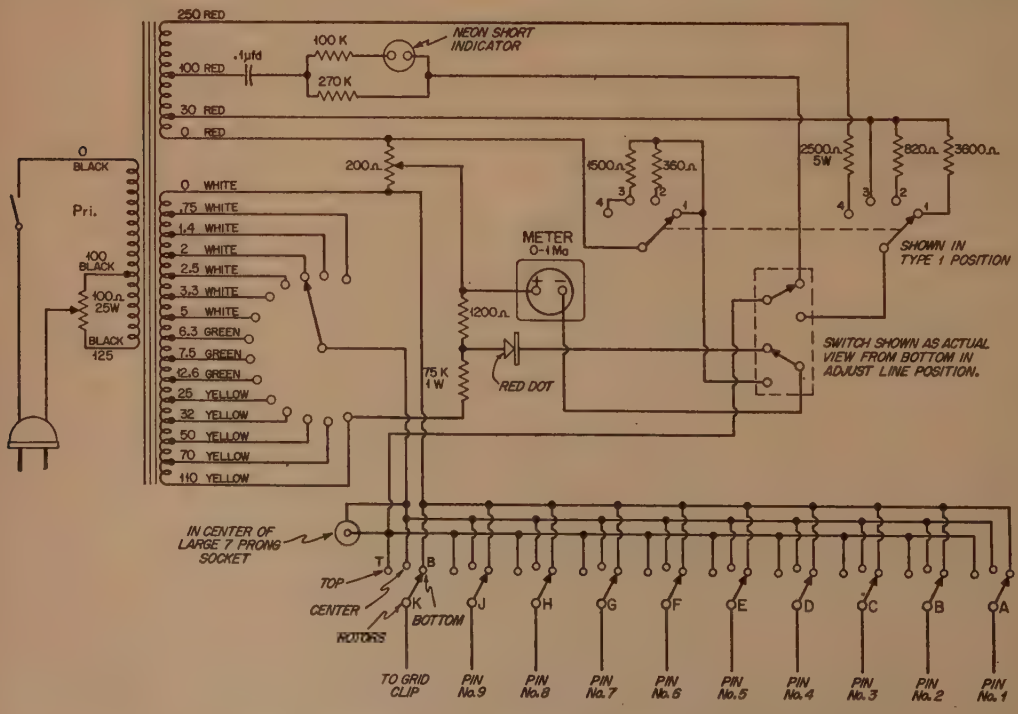


Fig. 3. Wiring schematic of the Heathkit TC1 shown in the photo above.

in series with one element at a time. A voltage is applied in series with the lamp and a current as small as a fraction of a microamp can be detected. If the test can be made with the tube hot it is doubly valuable, as many times a high resistance leak will develop only after a tube has become hot.

For those who like to keep things simple or have only an occasional need for a short checker, *Fig. 2* is suggested as a handy gadget. This will show a leak as high as several megohms and can be used with the tubes hot or cold. A full set of sockets is suggested but seven and nine pin miniatures plus an octal socket will take care of most needs.

To avoid complicated switches, tip jacks *J1* through *J9* are used. To test a tube hot, filament power from any suitable transformer can be plugged into the jack strip. *P1* and *P2* are then used similar to a continuity check between the various elements which are terminated at the jacks. Any leakage will show up a continuous glow of *V1*. Transformer *T1* can be a small 1:1 ratio isolation transformer or an old plate to grid interstage transformer.

The Heathkit TC1

As mentioned earlier there are a number of pieces of test equipment available at the present time in kit form. To find just what one of these low-priced testers can do, we constructed and tested one of them, a *Heathkit Model TC1*, in our own shop.

This kit is essentially an emission tester. With nine sockets it will accommodate all of the common type tubes. One blank socket is left for future tube developments. In the connection on the tube sockets all *number 1* pins are connected together, all *number 2* pins together, all *3*'s, *4*'s and so on around. A lead from each group of parallel pins is then hooked to the rotor of a three position switch. In this way any pin on any socket can be connected to either the plate or heater circuit forming a diode.

Figure 5 is a complete diagram of this checker and those who build it should have little trouble, as complete instructions are furnished. *Figure 4* is a rear view of the arrangement of switches and transformer. The filament voltage selector switch is mounted under the transformer and is the most difficult part of wiring of the entire job. A pair of needle-nose pliers and a small tip on the soldering iron will come in handy. If this instrument is used in areas where the line voltage is high it may be found necessary to disconnect the primary 100-volt tap from the end of the 100-ohm 25-watt potentiometer in order to set the meter to "LINE TEST."

From the standpoint of construction, little more need be said. Upon completion of the wiring it was plugged into the a.c. and all circuits worked satisfactorily the first time they were tried. The only part requiring any juggling was the mechanical arrangement of the tube index roll. If the proper amount of slack is not left in the paper it may have a tendency to bind near the ends of the roll.

It should be mentioned that the check for shorts is very good and can be used with the tube either hot or cold, and each element can be checked separately. We might add that standard parts are used throughout.

Summary

After looking over the field it is apparent that there is a tube tester for every purpose. The cost necessarily increases with the precision. Because a tube tester is only one of many items on most amateurs' want lists, somewhere up the scale is a point of diminishing returns for each of us. Even if you reach your limit with a neon bulb checker for shorts, build one and put it in the Ham shack. Your enjoyment of Ham radio will increase with each new piece of test equipment.

In the next part of the series the subject will be audio signal generators and their use in the average Ham shack.

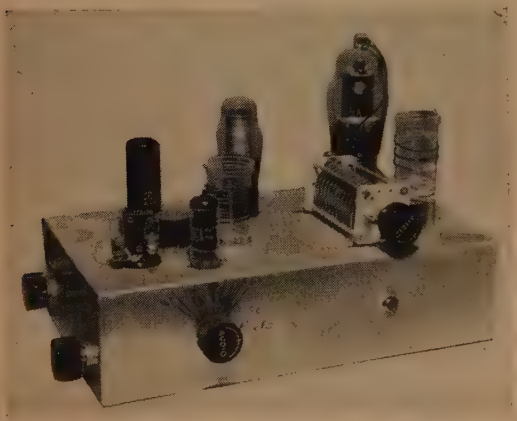
The completed tube checker. A 2E26 is being set up for test. Yes—tube checkers can be used to check out many of the various types of low power transmitting tubes.

Commentaries

A Department of Constructive Suggestions

Some Experimental Data on the 6CL6

The recent introduction of the 6CL6 tube for use as a television video output tube caused the writers to wonder how this tube might work as a crystal oscillator or frequency doubler for Ham use. Letters of inquiry to the tube manufacturers brought the reply that no data was yet available for class C operation of the tube.



Test oscillator used in the 6CL6 tests.

Naturally the only thing to do was to try the tube and this brief note indicates the results of comparing the operation of the 6CL6 to a 6AG7 in a typical crystal oscillator circuit.

The plan was to build two experimental oscillators, one using a 6AG7 and one using a 6CL6, and to switch their outputs into the grid of an 807 r-f amplifier, carefully measuring 807 grid current as well as pertinent oscillator voltages. Crystal current was approximated by use of a 60-ma. lamp connected in series with the 7-Mc. crystal.

As harmonic output was of primary interest, the oscillator circuit used was a tri-tet. Common experience as well as some experimental work[1] has shown this circuit to perform well. Two variable voltage power supplies were used, one for the oscillator screen and one for the oscillator plate.

Results are shown in *Table I* and indicate that in this test, at least, the 6CL6 performed quite as well as the 6AG7 (as shown by the 807 grid current) and it is apparent that the crystal current is substantially the same for both tubes. It will be noted, however, that neither tube operating as a quadrupler to 28 Mc. provided quite enough grid drive for efficient operation of our 807 amplifier.

In summary, the new 6CL6 appears to be equal to the rugged and reliable 6AG7 and any choice between the two must be largely based upon their physical size.

Edward Rasmussen and S. T. McNeal, W6LDJ

Break-in Monitoring Unit

This unit combines in one package all the necessary elements for a complete c-w break-in system. It can be adapted to practically any existing station.

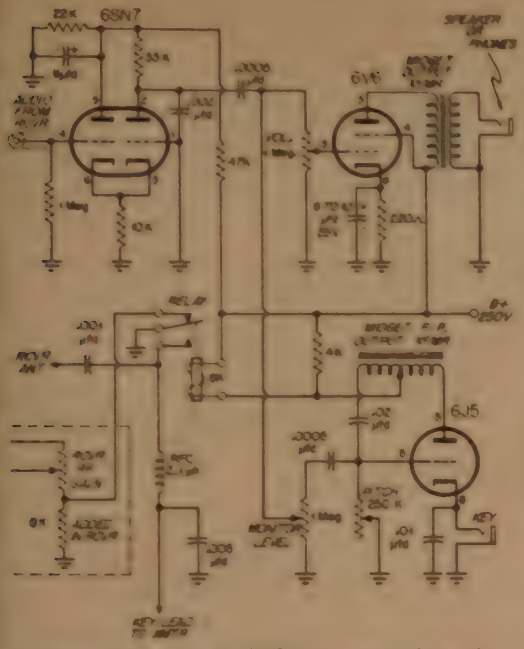
Basically, the requirements for full break-in are:

1. Receiver disabling/keying relay and supply voltage.
2. Audio noise clipper or limiter.

1. Chambers, "Crystal Controlled Oscillators," QST, March, 1950.

CRYSTAL	OSC. TUBE	OSC. OUTPUT FREQ.	OSC. E_p	OSC. E_{sg}	AMP 807 I_G	APPROX. XTAL I	OSC. I_p & I_{sg}	FREQ. OF CATH. TANK
7Mc.	6CL6	28Mc.	250	220	.0035	.070	.024	8.5Mc.
7Mc.	6CL6	28Mc.	250	220	.0028	.040	.034	14.5Mc.
7Mc.	6CL6	28Mc.	250	150	.0023	.043	.025	8.5Mc.
7Mc.	6CL6	28Mc.	250	150	.0026	.040	.033	14.5Mc.
7Mc.	6CL6	14Mc.	250	220	.0086	.035	.024	11.5Mc.
7Mc.	6CL6	14Mc.	250	150	.0074	LOW	.026	11.5Mc.
7Mc.	6AG7	28Mc.	250	220	.0028	.070	.024	9Mc.
7Mc.	6AG7	28Mc.	250	220	.0022	.035	.033	14.5Mc.
7Mc.	6AG7	28Mc.	250	150	.0018	.035	.025	9Mc.
7Mc.	6AG7	28Mc.	250	150	.002	.040	.033	14.5Mc.
7Mc.	6AG7	14Mc.	250	220	.076	.040	.023	11.5Mc.
7Mc.	6AG7	14Mc.	250	150	.065	LOW	.025	11.5Mc.

Table I. Tabulated results of the 6CL6 tests.

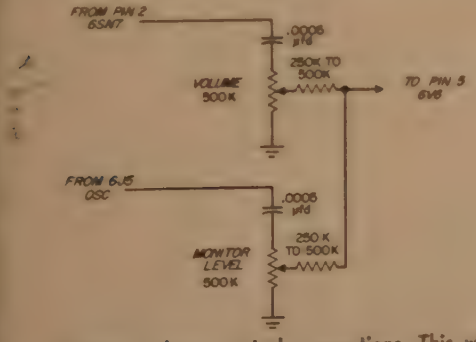


Wiring diagram of the WØSGG monitoring unit.

3. Sidetone oscillator keying monitor.

Referring to the schematic diagram it will be seen that all of these circuits may be combined in a single unit, eliminating the usual array of outboard setups. It is usable with transmitters in which one side of the keyed circuit is grounded. The unit has a power audio output stage with choice of speaker or 'phones, variable pitch and level controls for the sidetone oscillator, and a master volume control.

Keying is accomplished in the sidetone tube cathode lead. With some push-pull output transformers it may be necessary to by-pass the center-tap to ground through a 0.1-μfd. condenser to make the 6J5 oscillate. As this tube draws current the relay closes to short out the receiver antenna and at the same time places a high bias on the r-f section. Transmitter keying occurs simultaneously. The relay should be mounted very close to the receiver antenna terminals with the arm grounded to the receiver chassis. The ground lead of the r-f gain control is lifted from the chassis and connected to the "normally open" relay contact. The 8000-ohm resistor was sufficient to mute the receiver, but a higher value may be necessary with other models (HQ129X at this QTH).



Alternate volume control connections. This will reduce interlocking between the controls experienced in the schematic shown above. This change will also permit silencing the audio oscillator by reducing its control to minimum.

Heavy clicks from the receiver audio system are leveled off by the 6SN7 limiter tube. With the key released the entire setup returns to the *receive* side. The 2.1-mh. r-f choke and associated capacitors will be found to be an effective click filter for most low-level systems. It is also necessary to filter the key lead to the sidetone oscillator, preferable at the key itself. Generally, an r-f choke in each lead with a 0.01-μfd. condenser across the key will be sufficient. This filter should be adjusted so that no clicks can be heard in a nearby BC receiver with the transmitter off.

To place the system in operation the audio is taken from the receiver headphone jack. The keying lead from the transmitter is connected to the proper relay point. Set the receiver gain controls so that only strong signals are clipped and adjust the unit volume control for the proper level. Depress the key and set the sidetone pitch and volume to the desired levels. There is considerable interaction between these controls, but once they are set it is seldom necessary to make a change.

The power supply is not diagrammed as it is the conventional transformer type. A suggested volume control circuit is also shown for those who want to use the extra components to reduce the interaction effect noted above.

Otto L. Woolley, WØSGG

Use a Fuse

It is surprising to note how many circuits are built and operated by Hams without fuses. Proper use of fuses can prevent serious damage to equipment and as a prime example see the accompanying photo of my test meter. It was accidentally connected to a 250-volt circuit while the meter was set for the 10-volt range. Now it is fused with a 1/100 ampere fuse (1.0 milliampere meter movement) to prevent any further mishaps.

Power supplies are particularly easy prey to damage when improperly fused. In one installation a 20-watt carrier current transmitter was fused with an 8-ampere fuse in the 117-volt a-c line. One day when it went off the air (so-to-speak) from its remote location the repairman found it a smoldering mass of insulation compound from the transformers and chokes. The plate by-pass condenser had shorted out and grounded the power supply through the modulation transformer. The latter was only rated at 100 ma., but the power supply chokes and rectifier were rated at 250 and 500 ma., respec-

Learning a lesson the "hard way." No fuse—now no meter!

tively. The excessive current soon ruined all these components without blowing the fuse.

Upon investigation, it was quickly determined that under normal operation the power supply drew 113 watts from the 117-volt line, or slightly under one ampere. With the short circuit on the other side of the modulation transformer the load from the a-c line only went up to 330 watts, or about 3 amperes—no wonder the 8 ampere fuse didn't go west!

The moral of these two tales is apparent: use the smallest fuse that will carry the normal operating current load. Fuses are available in a large number of current handling capabilities and a wide variety of mounting clips or inserts. Don't wait until the meter needle is bent, or the rig is burned out. This *is* one place where an ounce of prevention is worth the pound of cure.

Edward J. Brauner, W2URF

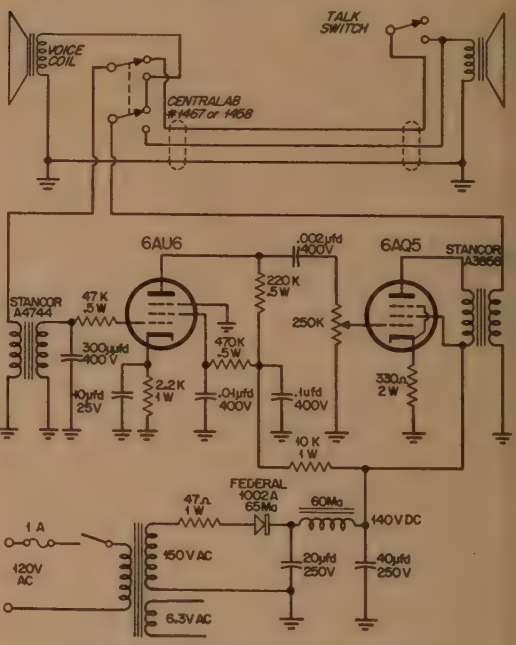
A Simple Intercom to the Ham Shack

Practically any married Ham will appreciate the necessity of an intercom when the Ham shack is in a remote part of the house, or even out in the garage, etc. After all, the call to chow is pretty important.

Intercom built by W6BLZ for the XYL.

The simplest solution is to build the intercom on a 6 x 8 inch chassis and mount the little gem on the wall of the shack. Mine is shown in the accompanying photograph. The holes for the loudspeaker were drilled using a lid from one of the BC-375-E tuning unit boxes as a template. The tubes extend outside for possible easy replacement.

The cathode by-pass condenser on the 6AQ5 was left out of the circuit to give a little degeneration and to reduce a-c hum. The interstage coupling condenser was also reduced to 0.002 μfd. to minimize a-c hum. It is a good idea to shield, or rather use shielded cable between the two stations. This will cut down the r-f pickup. The small resistor in series with



Wiring schematic of the intercom.

the 6AU6 grid and the by-pass across the secondary of the input transformer will help cut down r-f pickup.

It sure is a handy gadget when the shack is removed from the house—I missed the scream of the TV receiver—now all I do is call in and ask, "what channel am I on now?"

Ed Marriner, W6BLZ

As we mentioned in the November issue, the material appearing in this "department" consists of articles that do not rate feature billing, nor that are small enough to go under the "SHACK and WORKSHOP" heading. Contributions are also welcomed from readers which may be classified as only ideas or suggestions on construction or circuitry. Send them to "Commentaries," c/o *CQ Magazine*, 67 West 44th Street, New York 36, N. Y. All contributions are paid for upon publication.

The VHF-UHF News

FURMAN C. COBB

c/o CQ Magazine, 67 West 44th Street, New York 36, N.Y.

Many thanks to the fellows that wrote in and assured me of their cooperation in keeping the new column going. These were greatly appreciated and will go a long way towards helping us prepare interesting copy.

Converting the R-28/ARC-5 V.H.F. Receiver

Starting with this issue of the column I am pleased to turn over a portion of it each month to writers who will discuss various topics of interest to the gang. This month the space goes to Mr. Mack Spitzer of Los Angeles who brings us some data on the conversion of the R-28 ARC-5 v-h-f receiver.

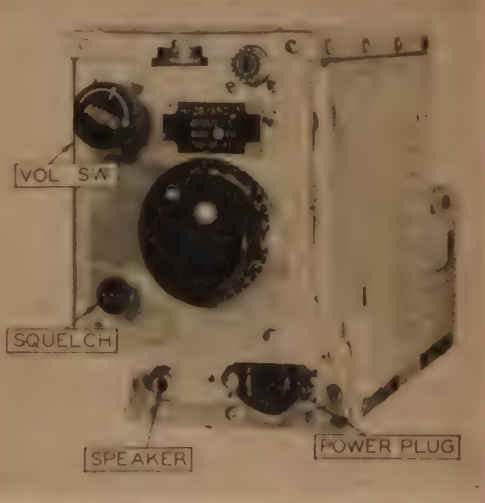
This unit was designed by the Western Electric Co. for operation on 24-28 volts. It fits into an FT 220-A mounting rack. The line-up is a 717A in the r-f stage, 717A as a mixer, 12SH7 oscillator and two more 717A's as multipliers, two i-f stages with 12SH7's, two 12SL7's in the detector, a.v.c., squelch and 1st audio stages and a 12A6 2nd audio output. Motor tuning to set the receiver on four channels is provided.

The first step in the conversion process is to replace the 12-volt tubes with their 6-volt equivalents (a 6V6 will replace the 12A6). Then remove the side and end plates of the receiver, and separate the receiver housing from the front end containing the motor. Remove the motor, but be sure to save all the gears. Leave the motor drive shaft in place. Note that two pieces of pressed iron constitute the frame that held the motor. As you take these apart notice that on the front of the larger piece is a raised portion that must be flattened out—otherwise it will interfere with the dial drive mechanism that is to be mounted.

Vernier tuning can be obtained through the use of the discarded parts from the motor drive mechanism. Remove the bronze gear and one worm gear from the shaft that has two worm gears. Be careful not to bend or spring this shaft. Enlarge the hole in this gear to ¼ inch and then drill and pin it about 11/16 inch from the bottom plate on the main drive shaft for the gear train. Make a bushing for the new dial drive (see photo) by forcing the 3/16-inch shaft into a short length of ¼-inch O.D. tubing and then trim the whole shaft to about 2-3/16 inches. Put the worm gear on this shaft and mount it at right angles to the bronze gear (again see photo) by making up an end bearing. The latter can be cut from a piece of square bar (or equivalent) that is 1 inch long and 5/16 or ⅜ inch on a side. Drill and tap one end for an 8-32 thread to mount it to the bottom plate (see photo). About ¾ inch from the tapped end drill a 3/16-inch hole for the worm gear shaft. Drill additional holes in the ¼-inch main drive shaft and put in pins to hold it in place.

From the aluminum cabinet, remove the door by drilling out the rivets in the hinges. Remove the two steel pins by twisting them out with pliers. Bolt a piece of aluminum (4⅛ x 4⅛ inches) to the front of the unit and cut out a 2¼-inch hole for the dial drive (centered about 2⅜ inches from the left side and 2½ inches from the bottom). Bolt the dial unit in place.

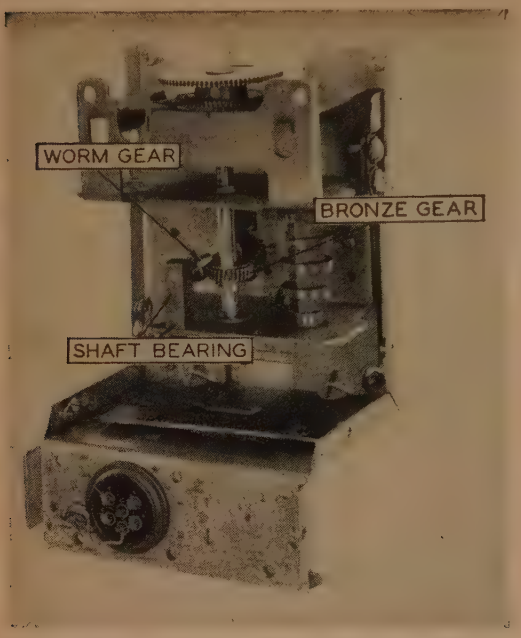
Remove all of the crystal sockets and relays. In opening up the bundle of wire going over the top of the unit be careful not to disturb the two wires going to the squelch and the one wire to the r-f stage.



Front view of the converted R-28/ARC-5 v-h-f receiver. A new power input socket has been mounted on the under-deck.

Convert the oscillator stage by removing the grid by-pass condenser (*C163*) from *pin 4* of *V108*. Add a 0.0001 μfd. from *pin 4* of *V108* to the cold side of *L111* at the junction of *R152* (1000 ohms). The 6SH7 should now take off on its own and be tuneable.

Remove coupling resistor *R136* (1.0 megohm) and coupling condenser *C149* (0.006 μfd.) from *pin 1* of the 6SL7 *(V106)* squelch amplifier. Replace with a single 0.01 μfd. Now remove *R143* (1.0 megohm) and coupling condenser *C154* (0.006 μfd.) from *pin 5* of the 6V6. Replace with a single 0.01 μfd. Remove the 47,000-ohm grid resistor *(R144)* from *pin 5* of the 6V6 and replace with a suitably connected



This photo shows the stripped down motor drive and tuning assembly. See the text for details on converting the original mechanism.

volume control (450,000 ohms with switch). For more audio remove *C157* and *R168* across the audio output transformer primary (*terminals 1* and *2*).

The impedance of the output can be changed from 600 to 8000 ohms by switching the connection from *terminal 6* to *terminal 3*.

Receptacle *J102* on the rear of the receiver should have *pins 3* and *4* connected to ground *(pin 1)*. Since the original squelch control has a short slotted shaft, use the control 6488 Type J from either a control box BC-496-A or from a C-25/ARC-4. A new speaker output jack was mounted in the front of the unit.

For simplicity, compactness and selectivity this unit is head and shoulders above many other war surplus equipments including the popular SCR-522 and BC-1068A.

What the Gang is Doing

Bill Bonnell, W5CVW (Ft. Worth, Texas) writes that the "West Gulf Emergency Net" has been formed and is active with 22 members in two states. The net drills each Tuesday at 1900 hours (CST). At 1930 hours the NCS checks in with the "Fort Worth Emergency Net" on 29.64 Mc. In this way they have reliable QRM-free outlets for 10-meter net. The 2-meter net covers considerable territory, extending from Hamilton (100 miles south) to Palmer (42 miles southeast) to Texarkana, Tex. (178 miles east) and up to Ardmore, Okla. (about 100 miles north). The NCS is a joint proposition with W5HD and W5CVW handling it from nearly identical stations (400-watt PP 4-65A). Currently active in the net are: W5HD, W5CVW, W5LAR, W5JQU, W5AJG, W5ABN, W5CAE, W5HHU, W5IT, W5JTZ, W5TJE, W5UND, W5YRY, WN5AJN, WN5ZUP, W5SCX, W5AQS, W5MWW, W5QNL, W5AIT and W5BEB.

Bernie Bates, W1BBM (North Harwich, Mass.) is still striving for more u-h-f activity and hopes that the new department will push the use of cavities and parabolas. Certainly they are not hard to get going at 1250 Mc. and above. How about some more mail on this from other interested parties. Maybe the column can work something up.

Tom Wing, W6MVK (Pomona, Cal.) reports on the last v-h-f Activity Contest that he is sponsoring. It was won by W6AJF with Frank turning in a record of 531 contacts on 144 and 420 Mc. The winner of the expedition award was W6MZX/6 with a contact on 'phone with KN6AAV/6 at a distance of 320 miles. Incidentally, W6AJF was the permanent winner of the V.H.F. Marathon contest trophy.

Ken Carter, W2QED (Seabrook, N.J.) sends in another FB report on his 420 Mc. activities. He reports that W2EWN (Haddonfield, N. J.) is on with a single 6J6 and W3TOM and W3GGR (Elkton, Md.) should soon be active. W3FU (Denton, Md.) is also expected to fire up. Ken got on 220 Mc. for the ARRL contest and make out quite satisfactorily.

Last month I started to mention the various club bulletins that give space each month to v-h-f activities and the writers of those columns . . . Down Georgia way, W4LNG has been carrying the freight in his column, "On the High Frequency Side" which appears in the **Atlanta Ham.** Ruddy has been active on the v.h.f. for quite some time with equipment on both 6 and 2. One of his recent columns reported that W4OZK, Alabama City had 11 states on 144 Mc. and was busily engaged in building a 150-foot tower with further plans for a 400-watt rig . . . Out in Cincinnati, W8HQK is the fellow that talks up 6 and 2 meters in the **Mike and Key.** Jack's latest column reported that during the contest the low end of two meters sounded like 20 'phone. He has also commented on the gradual decline of the phased array on 144 with the rebirth of interest in the stacked Yagi. Also noted in Jack's column that W8LPD is running 500 watts on 2 and that W8SDJ has put 826's in his new rig—one of the first in that area.

More on the clubs next month. Keep the mail coming and we'll try to make the column as informative as possible.

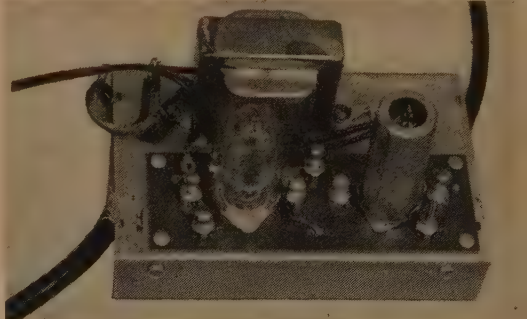
Test Report on the K & L 2-meter Converter

When I started the ball rolling on the revised VHF/UHF column there was one comment that appeared every so often; "How about some real dope on new products?" Both the old-timers and the newcomers were interested in getting factual reports on equipment, so to make a long story short, here is the first of a series of reports on items I have tested. Let me know what you think of these reports and whether they should be continued, expanded or deleted from the column.

The K & L Radio Parts Co. (1406 Venice Blvd., Los Angeles 6, Calif.) has placed a 2-meter converter on the market for a fairly low price which should encourage more activity from the fellows that don't want to make an outstanding investment in v-h-f gear. The converter uses a 6J6 in a push-pull r-f stage and a second 6J6 as a mixer/oscillator. The i.f. comes out in the range from 21 to 25 Mc. A selenium rectifier supply is incorporated in the **Model 2** kit and is the one tested here.

The kit is received with most of the circuitry pre-wired and I feel the average wireman could finish off the converter in something under two hours. Actually the only part of the circuit that is unwired is around the tuning coils. Our kit was complete except for the one piece of coaxial line that runs from the receiver to the converter. This was an accident on the part of the company as later kits that we have seen have been complete.

After wiring, the coils were set with a grid-dip meter and the converter worked right off the bat. The i-f signal output was none too strong, but this could be due to the



Model II of the K&L 144-Mc converter.

poor sensitivity of the receiver we used for the 21-25 Mc. tuneable i.f. As a matter of fact I have already noted that this receiver is no paragon of sensitivity on the 15-meter amateur band. The gain variation across the 2-meter band was average in every respect and compared favorably to the same effect noted with converters that cost two or three times this price.

The over-all sensitivity of the converter on 2-meters was what would be expected with the particular tube

lineup. The input is strictly made for 300 ohms. The noise figure was approximately 9 db., which is also what I would think was average for this push-pull 6J6 r-f stage. Some improvement might be effected by reducing the r-f stage plate resistor (this one had 33,000 ohms) to about 5600 ohms. The oscillator stability was good with c-w signals coming through between T7 and T8. The Model 1 might be the answer here with the power taken from a regulated supply in the receiver.

Recommended: for the fellow who wants to get on the band in a hurry or doesn't want to make a big investment in equipment. This converter is cheap, but foolproof. Should appeal to CD nets and clubs that want to build up contest scores by putting a lot of members on the air.

Not Recommended: for the serious v-h-f worker who will only be satisfied with maximum sensitivity and stability at any price.

A "Users" Report on the Helical Beam

In all probability there is more 420-Mc activity in England than in the United States and Canada. Whether this is due to the population distribution, or to the realization that someday our lower frequencies will be lost to the commercials, is hard to say. In any case, we are in receipt of some interesting material from D. N. Corfield, G5CD, on his 420-Mc helical antenna.

The helical beam was originally developed by W8JK and was described by W8RNC in the April, 1949 issue of CQ on page 13. As shown in the photograph, the helical somewhat resembles a "corkscrew" and it is fairly easy to imagine that it radiates a circularly polarized wave.

The helical has been in use at G5CD for over a year and has been found to work very satisfactorily with a 20-watt transmitter and a receiver with a noise factor of about 4 db. On tests the helical has the same directivity and front-to-back ratio as a 6-element Yagi, but just a little less gain than a Yagi with one specific polarization. It has also been observed that the helical tends to nullify the directional properties of other antennas, such as stacked arrays, where the mismatch causes them to radiate in both planes.

Helical beam installation at G5CD for 420 Mc.

A great number of checks have been made over the spectrum from 420 to 450 Mc. and it was found that the gain of the helical is not materially changed and no feeder mismatch could be detected.

The helical at G5CD was constructed in several sections. The reflector screen consists of concentric circles: 21, 16½, 12 and 7½ inches in diameter. The 16 radials and the concentric elements were made of #14 wire. The "hub" is made of insulating material and is 3 inches in diameter to support the helical while a ¾-inch conduit box at the rear is supported by the conduit arm. A metal plate about 6 inches in diameter (cut from brass) joins the radials and serves as a base plate for the conduit box on one side and the helical feedpoint on the other.

The helical is 6 turns of ½-inch O.D. copper tubing with a mean diameter of 8¼ inches and a pitch of 6-13/32 inches. The whole array is balanced on a ¾-inch rod of high-grade insulating material near the third turn. The feeder is a 136-ohm line common to the British Isles, but might be substituted for in the States with some of the new TV lines. The cable is fed to the beam through the conduit.

I have further details on the helical which I received from G5CD and would be glad to loan them and the drawings to anyone interested in putting one up.

Broad Band . . .

(from page 11)

can scarcely be considered an "average" SWL. He has been very active for the past thirty years and sends a QSL card packed with information on the received signal.—EDITOR.

Re Snorlock:

EDITOR, CQ:

We are going to miss Scratchi's wonderful humor every other month. Both my wife and I dearly enjoy his many experiences. We are still laughing over his rain making QSO with the East Indian witch doctor.

Snorlock sounds suspiciously like a cross between *Dragnet* and *Martin Kane*. We'll try to find a place for this new character; but Scratchi is unique and refreshing—just himself.

D. D. DICKMAN, W9SPK
Syracuse, N. Y.

EDITOR, CQ:

I could write a long detailed letter about the way I feel about the Scratchi vs. Snorlock Ohms affair, but I am just too mad to do so. Excluding Scratchi every 2nd month is like keeping a good friend out of my house and believe me it does not make me very happy with you.

ALFRED F. LUTZ, W9WJB
Des Plaines, Ill.

EDITOR, CQ:

Your new series "Snorlock Ohms" represents one of the poorest excuses of humor I have ever read. Give me good old Scratchi any day and any time. From now on I'll be skipping pages 6 and 8.

Go ohm, Snorlock, go ohm!

SAM D. LANFY, W5PPS
Denton, Texas

EDITOR, CQ:

I have in hand the October issue . . . suggest you "short" Snorlock in some perfect crime.

SPERRY B. SKILTON, W1KKG
Watertown, Conn.

(Continued on page 63)

20 years of precision short wav

peak

A message to the world's most critical expert ...the American Amateur

From Bill Halligan, W9WZE
President, Hallicrafters Company

This receiver, the new Hallicrafters SX-88, is the finest amateur communications receiver we have ever built.

Before the war, we came close to it with our popular SX-28 which proved to be a favorite with more than 50,000 hams. The SX-28 was widely used as well by the military. During the war and in the years that followed, we learned how to improve it.

All of these improvements, plus years of experience and know-how in communications have gone into the SX-88. As a result, this set has the highest degree of usable variable selectivity which has ever been commercially available. It incorporates a new audio system which provides for standard broadcast reception with near Hi-Fi quality, so it's equally adaptable for ham or home radio use. Further, it's engineered with built-in features for single side band exhalted carrier reception.

Our very first customer was a ham. Hams are and always have been our most important customers. It gives me the greatest of pleasure then, in this our twentieth anniversary year, to offer you the SX-88, a ham's dream receiver.

You owe it to yourself to have a look at it soon. See for yourself the features and engineering which make the SX-88 the biggest communications news of the year. We're proud of it. You will be too.

Sincerely,

Bill Halligan

Bill Halligan W9WZE
PRESIDENT

Gathered by DICK SPENCELEY, KV4AA

Box 403, St. Thomas, Virgin Islands, U.S.A.

Our heartiest congratulations to the following ation upon his entry to the WAZ lists:

No. 289 W6NZ Sydney J. Fass 40-148

Our welcome is also extended to the following wcomers on the HONOR ROLL:

W9ALI 39-136
TI2TG 38-212
KP4CC 37-191

In our quest to see how that other half survives dropped in on Hammerhead McGonigle, Brook-n's gift to the DX world, for a short DX talk.

We found Hammerhead in the process of working KH6 but from a decidedly sour expression on his n we deduced that all was not well. This was con-med when, after a perfunctory wave of greeting, volunteered the following: "I dunno what tings e coming to. I calls CQ DX and a lousy KH6 mes back. Now I gotta woik dis guy to get rid of m from cluttering up my frequency. How dey ever pect me to reach 200 I dunno."

Trying to be helpful we suggested a directional Q for DX, such as "CQ Asia" etc. "Naw!" oted Hammerhead, "Everyone knows dats for de ids, but sometimes I "CQ New Joisey" an' you kin nally get some pretty good stuff dat way some-nes."

"Well," we said, "how about tuning the bands for X?"

"Naw! dats no good neither," he replied. "You pect I should sit around here like a dummy, tunin', ain', tunin', wile de guy I am after over in ozambique is doin' de same ting? Let everyone do t an' whatcha got, dead bands, finally de FCC gets re-zo dis an' takes de bands away from us."

Slightly foozled by this logic we hastened to change subject by asking Hammerhead what was his eatest thrill in Ham radio.

"Well, lessee," he pondered, "I guess next to the ne my 813 went up in smoke it wuz the time I got QSL from FN8AD." We remarked that that was etty good DX. "Yep," said Hammerhead, "but de t part wuz dat on de date of de QSO I wuz itin' my cousin Knothead in Hoboken."

"You mean someone is pirating your call?"

"Could be—we got an awful shmoe down de block led Boidbrain McFinch. He gets delusions of nder every now and den and signs my call but I'm gonna fix him. You see dat gadget in de corner over dere?" Our gaze, following his pointing finger lit upon something which might have fallen off the Empire State building. "Well dat, went on Hammerhead, and keep it under your hat, is a death ray I am woikin' on an' as soon as I get it de-TVI'ed Boidbrain is gonna be one sorry hombray — — —."

At this point Hammerhead's face jerked to a full stop and we inquired, politely, if anything was wrong. Absorbing his somewhat glassy stare our ears recorded the following: "You'd better amscray now bud, dere's a VQ8 comin' t'ru — — —." Silently we tip-toed out . . .

160 Meter Transatlantic Tests

The periods for these tests appeared in October CQ. This is a reminder that a "Trial-Run" test will be held on December 20, 0500 to 0800 GMT. All 160 meter locals and DX are invited to participate. W's and VE's will call "CQ DX" the first five minutes and listen for the second five, etc. Please have your clocks on the dot as per WWV on 2500 kc. G stations now have newly assigned frequencies and will appear mostly between 1830 and 1870 kc. Here's to the best "Top Band" season ever. Let's go!!

W1BB

As 1953 staggers to a close we salute the DX activities of the following stations through whose efforts many of us were able to log a "new one:"

VS9AD/Sult. of Oman
HB1AG HE Liechtenstein
FP8AA and FP8AK/ St. Pierre
CE9AA/Easter Is.
VQ7UU/VQ9UU/ VS9UU/Aldabra Is./Seychelles Is./Sult. of Oman
CR5SP/Sao Tome Principe
ZC3AA/Christmas Is.
VK1HM and VK1BJ/ Cocos Is.
ZC5VS and ZC5VM/Br. No. Borneo
VQ1NZK/Zanzibar
VQ5RO/VQ1RO/Uganda/ Zanzibar
EA9DD/Rio de Oro
All LU-Z and VP8AJ/ Antarctica

We realize that most of the following items are in the "past tense" and of value only for historical purposes. To alert DX'ers for any expeditions word must be received here at least fifty days in advance. This is not always possible as many expedition ideas are born a month or less in advance of actual activity. On these we do our best to spread the "good word" over the air.

Well known wherever there is a Ham receiver is Doug Whitburn, VK5BY, of Adelaide, Australia. Doug is busy with QRP on 3.5 and 7 Mc. while waiting for the "good old days" to return to 14 Mc. His DX score stands at 202.

(Above) Nineteen year old Tom Gabbert, Jr., TI2TG, of San Jose, Costa Rica, needs no introduction to the DX fraternity. Tom got on the air in 1949 after a bout with Polio and enters the Honor Roll this month with 38-212 CW and 36-178 phone. A Collins 32V-1 drives a pair of 4-250A's modulated by 810's on all bands.

"Volt" Sotto, DU7SV, Cebu City, Philippines, may be seen here with his very neat setup.

The rotary beam setup of TI2TG.

Thoroughly enjoying themselves at the recnt D.A.R.C. convention at Iserlohn are (left to right) DL1IP, DL7AA and DL1FF.

One of the outstanding Czechoslovak signals emanates from OK3MM, seen above, with Jan in the operating position.

At Time of Writing

RIO DE ORO, EA9DD: Luis, EA4BH, was scheduled to go on the air from this QTH for a period of ten to fourteen days starting Oct. 16. QRG around 14010. We hope you nabbed him!

• • •

CHRISTMAS ISLAND, ZC3AA: Increased activity seems to be emanating from this spot. QSO's were noted around 1215 GMT on 14003. VFO is used.

• • •

REUNION ISLAND: FR7ZA: Via F9RS we learn that Louis was QRV from this QTH around Oct. 15. He now has a beam. Ten QSL's have been received for contacts with FR7ZA on March 13, 1953. These are NG as Louis was in France on that date.

• • •

LABUAN, BR. NO. BORNEO, ZC5VS/ZC5VM: Chances of contact with this spot have been enhanced by the activity of ZC5VM, Brian, on 14108. See QTH's.

• • •

FRENCH SOMALILAND, FL8AU: A QSO was noted between YN1AA and Gaston, FL8AU, on approx. 21040 kc., 1500 GMT, Oct 4.

• • •

TRINIDAD ISLAND, PYØAA/PYØAB (?): Since our flash announcement last month no further word has been received on this expedition which was scheduled to take place some time in November. Five or six PY Hams were to make the trip including PY2CK, PY2BEN, PY1AQT, PY4IE, and Mr. Flavio Serrano, DX editor of QTC. This spot is located about 1,000 miles off the East coast of Brazil and its status as a separate country is yet to be determined. Transmitter will be a Collins and the party, which includes the President of the State of Espiritu Santo, will be transported via Army/Navy Transport.

• • •

LAOS (FR. INDO CHINA), XW8AA: Activity has been noted from this station around 14100 kc. 40 watts phone/CW is used. F9RS advises that this is the proper prefix and that the prefixes of XU are used for Cambodia and XV for Viet-Nam. All these countries are presently on the FCC "verboten" list.

• • •

SUDAN, ST2UU: We have lost track of Jim for the moment, but rumors have it that he has shown up from FL8UU and 4W1UU. On Sept. 26 he departed for ZD3UU and was worked from FF8UU on Sept 28. Nothing further was heard from him although we have reports that his last xtal was shattered which kept him off the air. Let us know what xtals you want, Jim!!

• • •

SULTANATE OF OMAN, VS9AD: A trip to this spot and also to Masirah Island was scheduled for this station on Sept. 29/30. QRG 14020.

• • •

DUTCH NEW GUINEA, JZØKF: Henry continues activity from this spot and may be heard around 14090, 1200 GMT. A letter advises us that all stations from this country operate undercover but JZ is the proper prefix as all PK calls belong to Indonesia. QSL's go to ARRL and from there will be sent to Holland where they will be answered 100 per cent.

• • •

ZANZIBAR, VQ1NZK: A party consisting of VQ4RF, W6NZK and one other Ham operated from this spot between October 8 and 17. Seven, 14- and 21-Mc. operation was maintained and QSO's were noted on 21-Mc. phone. 120 watts was used and antennas were long wires.

• • •

JAN MAYEN, LB8YB: This station has been very active and may be found on 7020 or 14039. QSL's will be in one year's time.

• • •

WALLIS ISLAND, FW8AB: Some activity continues from here but no W QSO's have been reported to date. See QTH's.

• • •

CANTON ISLAND, KB6: W5SFT advises via West Gulf Bulletin that W7IIS/KB6 will be active from this spot for six months starting in October. Seven and 14 Mc. will be used and QSL's should go to W7IIS home QTH in Portland, Ore.

DX News in General

F9RS reports several phony FI8's such as AA, AG, AK, AR and AT. The only real ones are: FI8AD, who QRT's Nov. 17th, FI8AE, QRV soon and FI8AI, on phone . . . Activity from HR1AA and HR1AT continues on the low end of 20. The latter has a new beam . . . HH2CP, T8C, has been heard on 14067, 1900 GMT . . . DL3LL will leave for Haiti on about Dec. 1st and hopes to be active from there. He works for DL7BA's Telefunken factory . . . From OH2RY we hear that the SRAL will meet to discuss the separate status of the Island of Aaland under the call of OHØ . . . KC6AC, Carolines, was QSO'd on 7 Mc. by K6AHV . . . DU7SV and DU1CE may be found daily around 14080, 1300 GMT . . . KP6 activity is promised soon . . . VK9WK is located in Fort Moresby, Papua . . . As of Aug. 15, the prefix 487 has replaced VS7 in Ceylon . . . W2MJ worked one AC2NC (?), 2300 GMT, 9/24/53, 14020 . . . I5LV, Italian Somaliland, continues activity on 14046 . . . VP8AN may be heard Sats 2400 GMT 14014. QSL via Port Stanley, FI . . . HK1TH, Enrique, was heard on 14077, 1300 GMT . . . We noted VQ1NZK having the usual rough time with umpteen stations calling right on his frequency. It makes one wonder!! . . . Late word from Jim, ST2UU, says he is now at Khartoum and will not travel again until after the DX Contest . . . A new ZS7, ZS7H, has showed on 060; also nearby was ZS8D.

Exploits

Les, W8HGW, came up to date with a revised list jumping him from 40-211 to 40-253 . . . G6RH went to 244 with CEØAA, VQ7UU, VQ9UU and MP4ABW . . . W6AM recd card from ZA2AB to reach 242 while W6VE made it 220 with CEØAA . . . W6EFM now rests on 214 with ZP5AY, VS1FE, OD5LX, VK1BJ and CEØAA.

(Continued on page 65)

ALL TIMES IN E S T

EASTERN USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Western Europe	0830-1100 (2-3)	0730-1300 (3-4) 1300-1430 (2)	1530-2000 (3-4) 2000-0500 (2-3)	1730-2030 (3) 2030-0300 (3-4)
Central Europe & Balkans	0800-1130 (2-3)	0700-1200 (3-4) 1200-1400 (2)	1630-2000 (3-4) 2000-0330 (2-3)	1830-0200 (3)
Southern Europe & North Africa	0800-1400 (3)	0700-1400 (4) 1400-1630 (2-3)	1630-1900 (3-4) 1900-0300 (3)	1730-2030 (3) 2030-0200 (3-4)
Near & Middle East	0800-1030 (2)	0730-1300 (2-3)	1700-2300 (2)	1830-2200 (1-2)
Central & South Africa	0830-1330 (1)* 0700-1130 (1-2) 1130-1430 (3)	0630-1330 (1) 1330-1700 (3)	1730-0000 (2)	1830-2230 (1-2)
South America	1000-1530 (2)* 0800-1000 (3-4) 1000-1400 (2-3) 1400-1700 (4)	0700-1500 (3) 1500-1700 (4-5) 1700-1830 (2) 2230-0130 (1-2)	1730-0300 (3-4) 0300-0600 (2-3)	1900-0400 (2-3)
Southeast Asia	Nil	Nil	0400-0700 (0-1)	Nil
Australasia	1600-1800 (2)	0900-1100 (1-2) 1100-1900 (0-1)	0200-0800 (1-2)	0300-0630 (1)
Guam & Pacific	Nil	1600-1900 (1)	0200-0600 (2)	0300-0530 (1)
Japan & Far East	Nil	1600-1800 (1)	0400-0700 (1)	0430-0600 (0-1)
West Coast, USA	1200-1700 (1-2)	1000-1600 (3) 1600-1800 (4)	1930-0730 (3)	2100-0630 (3-4)

ALL TIMES IN C S T

CENTRAL USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe	0800-1030 (1-2)	0700-1130 (3-4) 1130-1300 (1)	1600-1900 (3) 1900-0200 (1-2)	1800-0200 (2-3)
Southern Europe & North Africa	0800-1200 (2-3)	0700-1300 (3-4) 1300-1430 (2)	1630-0100 (3)	1800-0200 (2-3)
Central & South Africa	0900-1300 (1)* 0700-1100 (1-2) 1100-1400 (3)	0600-1300 (1) 1300-1600 (3)	1730-2300 (2)	1900-2200 (1-2)
Central America & Northern South America	1100-1400 (1-2)* 0800-1430 (4-5) 1430-1600 (2-3)	0700-0900 (3-4) 0900-1500 (2) 1500-1730 (4) 2300-0200 (1-2)	1700-0500 (4)	1800-0400 (3)
South America	1100-1500 (2)* 0800-1400 (3) 1400-1630 (4)	0700-0800 (3) 0800-1500 (2) 1500-1730 (4) 2300-0100 (1-2)	1700-0500 (3)	1800-0430 (2)

ALL TIMES IN C S T

CENTRAL USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Japan & Far East	1600-1800 (1)	1500-1930 (2-3)	1600-1900 (1-2) 0400-0800 (2)	1630-1800 (1) 0500-0630 (2)
South East Asia	Nil	1600-1800 (0-1)	0200-0700 (1)	Nil
Hawaii	1100-1730 (2-3)	1000-1800 (2) 1800-2000 (2-3)	2130-1730 (3-4)	2230-0600 (3-4)
Australasia	1500-1830 (2)	0900-1100 (2) 1100-2000 (0-1)	0100-0700 (2-3)	0300-0500 (1-2)

ALL TIMES IN P S T

WESTERN USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Europe & North Africa	0700-0900 (0-1)	0630-0930 (2)	1530-0030 (1)	1800-2330 (1)
Central & South Africa	0900-1300 (1) 1300-1500 (2)	0600-1300 (0-1) 1300-1700 (2-3)	1600-2200 (2-3)	1830-2100 (1)
South America	1030-1400 (2-3)* 0730-1300 (3) 1300-1530 (4)	0600-1400 (2-3) 1400-1700 (4) 2100-0200 (1)	1700-0330 (3)	1800-0230 (2)
Guam & Marianna Islands	1330-1530 (1)* 1300-1800 (3-4)	1200-1800 (1) 1800-2000 (2-3)	2300-0800 (3)	0000-0700 (2)
Okinawa	1430-1730 (2-3)	1400-1730 (1-2) 1730-1930 (3)	2300-0900 (3)	0000-0800 (2)
Australasia	1500-1700 (1)* 1300-1700 (1-2) 1700-1830 (2-3)	0800-1030 (2) 1030-1800 (1) 1800-1930 (2)	0000-0700 (2-3)	0100-0600 (1-2)
Japan & Far East	1400-1730 (2-3)	1330-1600 (2-3) 1600-1900 (3-4)	2130-0800 (3-4)	2230-0700 (3)
Philippine Islands & East Indies	1500-1800 (2-3)	1400-1930 (1-2)	0200-0700 (1-2)	0400-0630 (0-1)
Malaya & Southeast Asia	1530-1700 (1)	1500-1900 (1-2)	0300-0800 (1-2)	0430-0700 (0-1)
Hong Kong, Macao & Formosa	1500-1800 (2-3)	1430-1730 (2) 1730-1900 (3)	0000-0700 (3)	0100-0600 (2)

Symbols For Expected Percentage Of Days Of Month Path Open:

(0) None (1) 10% (2) 25% (3) 50% (4) 70% (5) 85% or more.

* Indicates time of possible ten-meter opening.

Ionospheric Propagation Conditions

Forecasts by

GEORGE JACOBS, W2PAJ

144-40 72nd Ave.
[illegible]

General Propagation Conditions

10 Meters—DX generally poor, with erratic daylight openings possible on some circuits during good propagation periods.

15 Meters—Fair to good world-wide DX during daytime hours.

20 Meters—Band open for a relatively shorter period of time during daylight hours. DX conditions fair to good when band open, with signals considerably stronger than during other seasons.

40 Meters—Fair world-wide DX possible. Band quieter and signals stronger, will open earlier and close earlier on many paths as compared to late Summer and early Fall months.

80 Meters—Generally fair to good DX possible to many areas. Band quieter and signals stronger. Eighty meters will generally remain open to many areas, after 40 meters has dropped out.

160 Meters—December is possibly the best month for DX possibilities on this band. Decreased absorption and lower atmospheric noise levels should permit rather strong signals on many DX paths. This band should open during approximately the same hours on 80-meter openings, but on fewer occasions and with weaker signals than noticed for the same path on 80-meters.

This overall picture of band conditions is intended to indicate qualitative changes in each band from month to month. For specific times of band openings for any particular circuit, refer, as usual to the *Propagation Charts* on the opposite page.

This month's *Propagation Charts* are based upon predicted smoothed Zurich sunspot number of 15. The *Charts* have been calculated from world-wide ionospheric contours appearing in the monthly CRPL—D Series of the National Bureau of Standards, entitled "Basic Radio Propagation Predictions."

December, 1953

The month of December is usually selected as typifying general Winter propagation conditions. During December, a natural phenomenon occurs which has considerable effect upon shortwave radio propagation conditions. This event is called the *Winter Solstice* and marks the day when the distance between the sun and the earth is less than at any other time of the year. In addition to being nearest to the earth at the time of the Winter Solstice, the sun, as viewed from the Northern Hemisphere, will be lowest in the southern skies.

The nearness of the sun to the earth during the Winter months results in the sun's ultra-violet radiation sweeping across the ionosphere at more intense levels than at any other time of the year. The intense radiation results in a very strong *daytime* ionosphere that is able to reflect much higher daytime frequencies than during the other months of the year.

On the other hand, the longest daily periods of darkness occur in the Northern Hemisphere during the Winter months. During these hours of darkness, ultraviolet radiations from the sun cannot reach the layers of the ionosphere. These long periods of darkness permit extensive de-ionization of the ionosphere to take place. Night-time MUF values therefore, decrease considerable during the winter months, and reach their lowest average values usually during the month of December.

Ionospheric disturbances will most probably occur during December 3 and 4, 8-13, and 16-20. Periods of good short wave propagation conditions are expected during December 5-7, 21-24 and 26-27.

During December, therefore, while daytime DX hours are considerably shorter than during the other seasons, DX possibilities on the higher frequencies (10- and 15-meter bands), will be at its yearly peak for many circuits.

Solar absorption and atmospheric noise levels decrease considerably in the Northern Hemisphere during the Winter Solstice period and improved nighttime DX is expected on 40, 80 and 160 meters.

While the maximum occurrence of sporadic E type propagation is observed during the Summer months, there is, nevertheless, a minor peak usually noticed during the month of December, permitting, on occasion, medium-distance short-skip communication on the 10 and sometimes 6-meter amateur bands. There is also somewhat of a tendency for Aurora-type very high frequency propagation to occur during periods of winter-time sporadic E occurrence.

Propagation Conference

A joint meeting of the International Scientific Radio Union (URSI) and the Institute of Radio Engineers (Professional Group of Antennas and Propagation) was held at Ottawa, Canada during the early part of October. The basic aims of both these organizations is (1) to promote the scientific and engineering study of radio communications, (2) to aid and organize radio research requiring cooperation on a national and international basis and to encourage the discussion and publication of the results, (3) to facilitate agreement upon common methods of measurement and the standardization of measuring instruments.

In pursuit of these aims, several papers on the various aspects of recent research in the fields of radio propagation and antennas were delivered at this joint session.

Of particular interest to Amateurs were the group of papers concerning recent investigations of Aurora and its effects upon radio propagation. A. G. McNamara of the University of Saskatchewan, in his paper entitled "Radio Reflection From Aurora," discussed the nature of radio reflections from Aurora as observed from a long series of observations on 56 and 106 mc. Measurements made at Saskatchewan of the flutter fading associated with Aurora reflections, indicates that the fading rate on CW signals varies at an audio rate between 100-2000 cps, with 200 cps being the most common rate. Mr. McNamara also discussed the close correlation observed between Auroral reflections and magnetic disturbances. Certain types of E region ionospheric reflections have also been observed as occurring simultaneously with magnetic disturbances that are associated with the observation of auroral light.

Dr. H. G. Booker, in a paper entitled "An Interpretation of Radio Reflections From The Aurora," discussed the results of a similar investigation conducted by

(Continued on page 64)

Monitored by LOUISA B. SANDO, W5RZJ

959-C 24th St., Los Alamos, New Mexico

They say a YL is always a YL, though she may live to be 70. Though *this* YL may get to be 70, and whether or not she may still be a YL, she'll *never* forget the 1953 Southwestern Division Convention held at Los Angeles October 9-11. As a reporter possibly we should not get personal, but this one time, at least, we must.

We'd been eying the approaching S.W. Division Convention with longing ever since W6FEA told us about it last May when she was operating portable 5. Then, together with news of convention plans, came the query from W6WRT—"Do you know a YL who'd like to stay with me during the convention?" "Sure," was our reply—"me." And therein started the chain reaction . . .

Four days before the convention W6CEE met us as we climbed off Santa Fe's "El Capitan," and we were off to a royal welcome and a whirlwind of activities. Vada took us to Maxine's, 6UHA, in time for the 9 a.m. Wed. YL net on 3915. W6PJF is NCS. That morning she checked in 6FEA operating mobile, NLM, JMS, WRT, KER, CEE, JZA, EHA, CQV, QGX, MFP, IFK, HTF and QYL.

Hardly had we finished talking with them than several of the girls on the net, together with 6QOG, KYZ and LBO came in for lunch. For this occasion, Maxine had ordered one of her now-famous cakes, inscribed YLRL-W5RZJ on either side of a tower with beam. Dining and gabbing were interrupted only long enough to hold a roundtable with KH6AFN on 20. The girls tossed around the idea of a convention in Hawaii and Jeannette assured us of KH6 hospitality. Any more of you have some thoughts on this suggestion?

Throughout our visit we stayed at Burbank with W6WRT, Ruby, and her OM, W6UTZ—son Robert kindly letting us move in among his cowboys—hi! The next a.m. Ruby drove us to the NBC studios in Hollywood to be guest on Lenore's W6NAZ T program. How different to be in front of the T camera instead of the receiver! Quite an experienc and lots of fun—with Lenore, at least, for she mak one quite at home in her "kitchen." For a lon time Lenore has starred in TV shows and for som time she has been doing a daily half-hour sho called "Food for Thought" on KNBH. The day w appeared the name was changed to "Key to th Kitchen." Lenore presents unusual recipes or way of serving food, and usually has a guest—fro Hams (YLs, that is!) to an Arabian prince. Pleasan surprises were gifts for both Ruby and your edito

On Friday W6WRT whisked us in and out c traffic (and after the wide open spaces of Ne Mexico—that traffic!) to pick up W6NLM an then to W6WSV's QTH. Carol had a deliciou Chinese luncheon and we chewed the rag till ou voices gave out.

Saturday was *the* day of the Convention—registr tion, forums, code contest, luncheon with fashio show at Bullocks, tours, visiting with friends, th pleasant surprise of finding W5CA and XYL fro "home," the banquet *and* prizes. YLs attendi totaled over thirty in number, including: W6WR Ruby; NLM, Beulah; UHA, Maxine; KER, Gild CEE, Vada; JZA, Elsa; EHA, Gen; CQV, Ma OBZ, Joan; QGX, Harryette; MFP, Agnes; KY Ann; LBO, Mary; WSV, Carol; DXI, Gladys; JC Betty; QLM, Dot; PPY, Ruth; KOY, Betty; PJ Mildred; GAI, Frances; TDL, Clara; QYL, Martha GKJ, Rose; QOG, Helene; DQD, Betty; JMC, Mar LMQ, Eleanor; PCO, Mary Ann: KN6CAL, Isabel W8HPO/6, Ernestine; WN8MHE, Wanda, a W5RZJ.

YLRL Nets

PHONE

Band	Freq. (kc.)	Day	Time	NCS
75	3900	Wed.	7:00 a.m. EST	W3RXV (Acting)
	3900	Wed.	8:00 a.m. EST	W8HLF
	3900	Wed.	9:30 a.m. EST	W8ATB
	3900	Mon.	3:00 p.m. PST	W7HHH (W7SBS Alternate)
	3915	Wed.	9:00 a.m. PST	W6PJF
20	14240	Thurs.	2:00 p.m. EST	W6EHA
10	28900	First Tuesday of each month, 9:00 p.m. EST QRMary Net, roundtable.		

CW

80	3610	Wed.	9:00 p.m. EST	W9JTX
40	7034	Tues.	1:30 p.m. PST	W7ROA (W7RLH Alternate)

YLs Win the Prizes

All the prizes were given during the banquet. turned out to be the YLs night—every major co vention prize (except a TV receiver) was won by YL! We heard rumblings among some of the OM the following morning that next year's would be a all-male convention—hi!

First on the list was an award to W6OBZ, L.A.'s "Miss Amateur Radio of 1953." Joan is a senior in high school. Just before the conventio Ham radio and the YLs in particular receiv some nice publicity with writeups and pix in sever of the papers of Joan and her mother, 6CQV. Jo received a Telex headset—and so did her moth for May was winner of the YL CW contest.

Drawing for prizes got under way. First luc YL was W6JCA. Betty won a $50 credit on a V- antenna. Pre-registration prize was a comple mobile station. W6LBO, Mary, won: a Gonset co

(Above) YLs attending the YL breakfast October 11th during the Southwestern Division Convention at the Ambassador Hotel in Los Angeles. Left to right, front row: W6UHA, QGX, PJU, KER, OBZ and JZA. Middle row: W6QOG TDL, MFP, KYZ, JCA, NLM, WN8MHE, 6PPY and GKJ. Back row: W6EHA, GAI, WRT, LBO, 5RZJ, 6QYL, WSV and CEE.

verter, Gonset all-band transmitter, and Master-Mount antenna.

Then came the prize for the YLs and the XYLs—the Pfaff sewing machine we'd all been wishing for. W6PPY, Ruth, was the lucky gal—we hope she can operate it as well as she can a key.

Other (consolation!) prizes went to W6QLM, Dot; PPY (again), and Rocky, XYL of Director W6KW. We never did find out what they were—this YL just simply got too excited! And who wouldn't? The grand prize was called—from what seemed a very far off distance we heard a voice saying, "Louisa Sando, W5RZJ . . ." Out of nearly 700 tickets, W4GF had pulled ours. What a thrill! A complete Hallicrafters station—HT-20 transmitter, SX-71 receiver and R-46 speaker. (Anyone want to buy some used gear? Hi!) Didn't seem quite right taking it out of the division, but Sunday morning at the YL breakfast all the gals were so kind in saying they couldn't think of anyone they'd rather have it happen to.

The YL breakfast drew twenty-three YLs. As president of the Los Angeles YLRC, W6KER, Gilda, presided at the breakfast. A 6th District YLRL

(Continued on page 63)

PHOTO COURTESY W6WRT & W6UTZ

(Above) Holding the mike is W6OBZ, 17-year old Joan Dobson, L.A.'s "Miss Amateur Radio of 1953." With Joan is her mother, May, W6CQV, in the shack they share with May's OM, W6VBN.

(Right) Original members of the Los Angeles area YL 2-meter net which was started at the YLRC family picnic last July. L. to r.: W6CEE, QGX, PJU, LBO, KN6ANG, and 6KYZ. The net meets every Wednesday at 7 p.m. on 146.1 Mc. Grouped within a 30-mile radius and separated by hills, the YLs are having mostly 5 and 9 signal reports. Other check-ins include W6LMP, JZA and EHA.

NOVICE SHACK

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Instructions for tuning a transmitter usually go something like this: "Tune the plate condenser for the dip in plate current. Connect the antenna and loosely couple *L1* to *L2*. Retune the plate condenser for minimum plate current. Tune the antenna condenser for maximum plate current. Retune the plate condenser for minimum current, which will be somewhat higher than before. Increase coupling. Retune. Repeat until the desired plate current is being drawn."

Following such a set of instructions carefully will usually result in a properly tuned transmitter, but in following them, the inexperienced operator has only the haziest idea of what he is doing. If it were possible to *see* the results of making various adjustments on a transmitter, all the uncertainties would be eliminated. Actually, you can do that by investing less than a dollar in a couple of incandescent light bulbs.

Learning to Tune A Transmitter

For the purpose of illustration, we will assume that we are tuning up a 40-watt transmitter consisting of an untuned crystal oscillator, driving a 6L6 or 807, which is link coupled to a simple antenna tuner. The basic principles apply equally well to any transmitter.

We need a *No-47*, 6.3-volt, 150-milliampere pilot bulb and a 25-watt, 117-volt light bulb. In addition, if you can find one, a 25-watt, 32-volt bulb, such a used in 32-volt farm lighting systems. Four 14-vo "Christmas-tree" bulbs, connected in series-paralle may be substituted for the 32-volt bulb if they ar easier to obtain. Sockets to accommodate the bulb are convenient, but leads may be soldered directl to the bases of the bulbs.

To prepare the *No-47* pilot bulb for use, form loop about two inches in diameter of stiff, insulate wire and connect the ends across the bulb.

During the following tests and experiments, pres the key no longer than necessary to make an ob servation or adjustment, so that unloaded or of resonant operation of the tank circuit does no

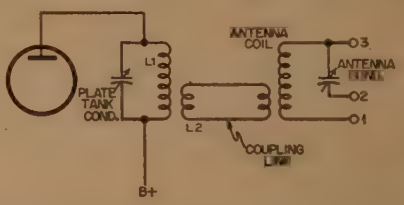


Fig. 1. Basic diagram of plate tank circuit and antenna tuner. For series tuning, the antenna lead is connected between points 1 and 2. For parallel tuning, these points are tied together, and the antenna feedline connected across all or part of the antenna coil. See text.

This is Bob Sommer, K2BHE, at the key of the station that he and W2OLY operate as a joint project. Bob celebrated his 16th birthday by passing his General exam. Using 25 watts input and a Hallicrafters S-38 receiver, Bob has worked 37 states, Canada and Mexico.

result in damage to the equipment. Also be exceed ingly careful not to touch any component in th transmitter with the power applied.

Disconnect the link between the transmitter an the antenna tuner. Set the plate tuning condens to maximum capacity. Press the key and note th reading on the plate current milliammeter. It wi be quite high. Quickly turn the condenser toward minimum capacity. At one point, the plate curren will drop sharply and then start increasing again the condenser is turned past this point. Set th condenser to the minimum current point and releas the key.

Holding the *No-47* pilot light tuning loop by th bulb, bring the loop parallel with the end of th plate tank coil and press the key. As the loop brought close to the coil, the bulb will glow. D not bring it too close, because it is very easy burn out the bulb.

The power which lights the bulb is r-f energy co verted by the vacuum tube from the d-c power fe to its plate from the power supply. This r-f energ is stored in the plate-circuit, coil-condenser in th

Although Dick Mills, WN8OUM does most of his operating from Cincinnati, Ohio, this photo was taken in Tombstone, Arizona.

form of a circulating current. The ability to "store" r-f energy is what gives this part of the circuit its name "tank circuit."

Fundamentally, the power is furnished by the power supply; therefore as the bulb gets brighter, the plate milliammeter should read higher. Because the power required to light the bulb is slight, the increase in current will be slight also.

Now detune the plate condenser either way from the minimum current point. The d-c plate current will increase sharply, but, instead of glowing more brightly, the pilot bulb will actually get dimmer. The more the condenser is detuned, the higher the plate current goes and the dimmer the bulb gets, until finally, even with the loop as close to the tank coil as possible, it will not glow at all.

Under these conditions, all the power being delivered to the tube is being dissipated as heat by its plate, which may become red hot. The tube will certainly be ruined, if operated like this for an extended period; therefore, release the key to allow the tube to cool off. Then retune the condenser for minimum plate current. You have demonstrated why one of the very first steps in adjusting a transmitter is tuning its tank circuit to resonance.

Shut off the transmitter and connect the 32-volt bulb to the link output terminals, and pull the link winding away from the tank coil. Turn the transmitter back on. Press the key and retune the plate condenser to be certain it is still tuned to resonance. Depending upon how close the link winding is coupled to the tank coil, the minimum plate current will be somewhat higher, and the bulb will glow.

With an insulated rod, push the link closer to the tank coil until the tube draws its rated plate current *or* until increasing the coupling does not further brighten the bulb—whichever occurs first. Always retune the plate condenser to resonance as required. It should be possible to draw rated plate current before the power output starts flattening out. However, this is not always true. It may happen that increasing coupling beyond a certain point actually decreases output, although the plate current continues to increase. Naturally, there is no point in going beyond this point, no matter what the value plate current.

Decreasing output with increasing coupling may be caused by a defective tube, low filament voltage, low screen voltage, or a condition of excessive or inadequate grid drive.

When the screen voltage is obtained through dropping resistor from the high-voltage power su ply, excessive grid drive and low screen voltage f quently go together. The high value of drive resu in excessive screen current, increasing the volta drop across the screen resistor. This, in turn, creases the effective screen voltage. Excessive dr may be decreased by reducing plate and screen vo age of the preceding tube.

With many transmitters, it is possible to contin to increase loading until the plate current is above the rating of the tube. Overloading tubes, ho ever, is poor economy. It reduces tube life mu faster than it increases signal strength.

Once optimum coupling has been found with 32-volt bulb, replace it with the 117-volt bulb. Y will quickly discover that, although the two bu have the same wattage rating, the second bulb w load the transmitter very lightly with the sa amount of coupling. You will probably have wind a temporary link winding directly over tank coil to get power into the second bulb. C versely, a degree of coupling that is correct for t bulb will be much too great for the first one. New theless, once the coupling is adjusted for eq plate current with either bulb, one will glow just brightly as the other.

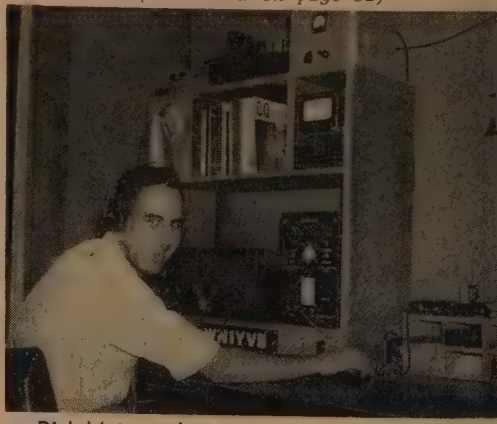
The above also illustrates the importance "matching." The 32-volt bulb has an impedance approximately forty ohms, while the 117-volt has an impedance of 660 ohms. If you wish to ca the experiment one step further, obtain a pair 10-watt, 117-volt bulbs and connect them in ser Their combined impedance of 2800 ohms appro mates the end resistance of an end-fed ½-wave tenna, and it will be virtually impossible to get a appreciable amount of power into them with simple link coupling.

Testing The Antenna Tuner

Set up the antenna tuner for series tuning and c nect the 32-volt bulb across the output terminals. T is, connect the antenna coil, the antenna tuning conde er, and the bulb all in series. Connect the out terminals of the transmitter to the input terminals the tuner.

With loose coupling between the plate coil and its l winding, press the key and tune the plate condenser minimum plate current. Now tune the antenna conde

(Continued on page 52)



Dick Metz at the operating position of his station, WN1YVB, Waltham, Mass. The transmitter is a Harvey-Wells TBS-50 and the receiver is a Hallicrafters SX-71. The antenna in use is a "fishpole" described by WN8QKW in the April 1953 column.

(from page 50)

er for maximum plate current and re-dip the plate condenser. Increase coupling between the plate coil and its link winding until normal plate current is drawn with the plate tank tuned to resonance.

As before, increased coupling means both increased input and increased output, as long as the plate circuit is tuned to resonance. In addition, the antenna circuit must be properly tuned, in order to get efficient energy transfer. Substituting the higher-resistance bulbs for the 32-volt one will reveal that series tuning is not satisfactory for high-resistance loads.

Change the antenna tuner over to parallel tuning by connecting the condenser directly across the coil, and tap the bulbs across a portion of the turns in the coil. The 32-volt bulb should be connected across only a few turns, the 117-volt one should be tapped across about a third of them, and the two bulbs in series may be connected across practically the entire coil.

In tuning, you will discover that the fewer the turns across which the bulb is tapped, the sharper the tuning of the antenna condenser becomes, the looser the coupling required to draw a given plate current, and the warmer the antenna coil becomes. Tapping the bulb across more turns broadens the tuning, increases the amount of coupling required, and makes the antenna coil run cooler.

Normally, it is desirable to tap the load across as much of the coil as will permit proper loading, because it makes tuning less critical and keeps losses to a minimum. However, except for very low resistance loads (which can always be series tuned, anyway) the placement of the taps is not critical. But why am I telling you these things? You have the equipment before you and can see for yourself.

The 40-ohm impedance of the 32-volt bulb approximates the type of load presented to the transmitter by a ¼-wave grounded antenna or the average ½-wave antenna fed in the center with low-impedance line. The two 10-watt bulbs in series is similar to the load presented to the transmitter by an end-fed ½-wave antenna.

After spending a little time with the light bulbs, you will have the transmitter eating out of your hand, and when you connect your transmitting antenna, you can visualize just what is happening when you make each tuning adjustment. Just remember to keep the plate tank circuits tuned to resonance at all times, and do not increase coupling beyond the point of optimum plate current.

Checking Other Transmitters

Other size bulbs can be used to carry out a similar test procedure with transmitters of different power ratings. A 14-volt "Christmas-tree" bulb and a 7-watt, 117-volt one will be satisfactory for a 10 to 15-watt transmitter, and a pair of 25-watt, 117-volt bulbs will be right for a 75-watt transmitter.

Pi-network output tanks are tuned in essentially the same manner as the conventional parallel tank circuit, plus antenna tuner. The output condenser controls loading and the input condenser controls resonance.

In tuning a multi-stage transmitter, always start tuning with the oscillator and work towards the antenna, removing plate and screen voltages on all stages beyond the one being tuned. The tuning of some crystal oscillators is a little "tricky." It may be necessary to detune the plate tuning condenser slightly from exact resonance and limit the amount of power drawn from the oscillator in order to obtain good keying. Monitoring the signal in your receiver while tuning is necessary to insure the best compromise between power output and good keying.

Letters And General News

Undoubtedly, you have all heard about the proposal of the FCC to issue all Novice and Technician licenses by mail. Details were given on the editorial page of last month's CQ. There is still time for interested parties to file comments on the proposal with the FCC.

Those of you who are just about ready to take the examination may be tempted to wait until this proposal goes into effect to apply for a license. You may have to wait a long time! Even if it goes into effect without protest, there will be a lapse of several months before all the machinery for the new procedure can be activated. If hearings must be held on it, much more time will elapse. And there is always the chance that the idea may never get beyond the proposal stage.

Al, KN2DPQ, upon writing had had his call for two months and thirteen days. "So far I have 12 states confirmed and am sweating out two more. Best DX has

(Continued on page 54)

LEO I. MEYERSON
W6OFQ

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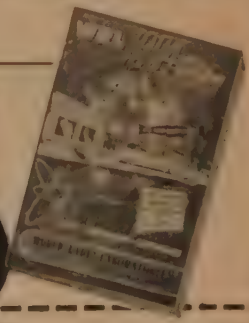

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(from page 52)

been Nevada, about 3000 miles. My transmitter is a TR-75, receiver is an S-40A, and the antenna is a bent, off-center-fed wire, 128 feet long. One thing I'd like to say to other Novices is to tune over more of the band after you call CQ, instead of listening only on your own frequency. I have managed to snag some nice QSO's by tuning the entire band after my CQ's."

Yves, VE2ATD, reports from Quebec. "Dear Herb, Another Novice! Yep, a Novice from Canada with no N in his call. I have been interested in radio since 1949, but didn't have the courage to tackle the code. Finally, I decided to learn it and did with the help of VE2GF, and I got my ticket in May. Running forty watts on 40 meters and thirty watts on 20 meters to a 6AG7-807 rig and ½-wave folded dipoles, I have had 560 QSO's with twenty-two countries and thirty-nine states. The receiver is an S-40A that really does nice work. I think that a QSO is about twenty-five per cent receiver and seventy-five per cent operator. And I believe in low power rigs. The man who talks louder isn't always the one who is right. Yes, sir, Ham radio is just great, but there is no use talking about this to a Ham, hi. I am twenty years old and studying to be an engineer (in electronics, of course) at Laval University in Quebec."

Tom, WN4BQF, writes, "Dear Herb, I have had my license for not quite a month. I use a home-brew, 6AG7-2E26 rig, running 26 watts input, and an S-40A receiver. I have worked twenty-two states and VE2 on 3.7 and 7.2 Mc. Low power really gets out! Now I am thinking of trying the 21-Mc. band. Thanks for information about it in the September Novice Shack. My dad, W4BVK, helped me build my transmitter."

Dean, KN6BUY (11036 Tirmon, Lennox, Cal.), says, "Dear Herb, After a week of fixing, I finally got on the air! In a week and a half now I have worked twenty different stations. My best DX is only sixty miles, but I am building the 'Midget 80-meter Vertical' described in CQ for November, 1952, which I think will work better than the ¼-wave antenna I am using now. My present transmitter is a 6L6, running 30 watts, but I have a new one using a pair of 807's under construction. Receivers are a converted BC-454 and an old PR-15. Some day, I hope to have an S-76. My big thrill wo be to work a W2! And I'd like to have some pen pa

"Chic" Barnett, KN2BVF, is afraid of being thou of as a bootlegger because I deciphered his call lett as KN2BVM in the October column. Also his brot Ed's call is KN2BVG, not KN2BVQ. I am glad to m these corrections. The incident highlights the importa of printing call letters very clearly. Otherwise, I m guess at them, after again reading the letter in effort to find something that looks like the doubt letter in a recognizable word.

To WNØNLR: Please send me your address. I h a letter postmarked Australia for you.

Bob, K2BHE, writes, "Dear Herb, I was just sixt last week when I got my General Class license. A Novice, I worked thirty-seven states, Canada and Mex with 26 watts input to a 6L6 and an S-38B recei My antenna is a 130-foot wire, and I operate on b 3.7 and 7.2 Mc. Both W2OLY and I use the same ri

Jim, W9WWJ, (Box 87, Menomonie, Wisc.) has been promoted. "Dear Herb, My Novice days are behi I am now a GENERAL with 25 watts on 3.7 Mc. and watts on 7.2 Mc. to my Philmore transmitter, I had Novice contacts in six months and four days. Inclu in them were contacts with forty-two states, Mex

> The wiring schematic of the 6V6 transmitter show on page 50 of the November, 1953 issue should b corrected by replacing the 200 $\mu\mu$fd., condenser (C4 by one with a value of 20 $\mu\mu$fd.

Canada, and forty-two YL's. Since being on phone w my new Viking (three days), I have worked ninet states and Canada. I have also had the very thrilling perience of relaying a few important messages. Oh y I have 301 QSL's and have 142 out that have been answered. This is a bad deal! When you do answer QSL cards, it gives people a poor opinion your station. If I have missed anyone with a card, j let me know, and I'll remedy the oversight."

Nat, KN2DYB, reports a new net. He writes, "D Herb, W3VMS, KN2DFZ, and I have organized a which meets Monday through Saturday at 3:45 p.

(Continued on page 56)

(from page 54)

eastern time on a frequency of 3746 kc. KN2DYB is the net control station, and we need new members in the first ,second, and third call areas. The only requirement for membership is that you can operate between 3735 and 3750 kc. My rig consists of a Heath AT-1 transmitter running 35 to 40 watts, a ½-wave zepp antenna, and a NC-57B receiver."

Novice Exam Help

Tom, WN8NRF, and Jim, WN8MYV, offer helping hands. "Dear Herb, We are willing to help anybody in the Detroit area who wants to get his code speed up; so that he can pass the Novice examination. If anybody is interested, write to either Tom Sidwell, WN8NRF, 14458 Warwick, Detroit 23, Mich., or to Jim Bittle, WN8MYV, 14545 Rosemont, Detroit 23, Mich. 73"—Tom, WN8NRF.

Those desiring help are:

Manny Bogner (15), 41-1612 St., Long Island City, New York.

Robert Bancroft (15), 24 Farragut St., Rochester 61, N. Y.

A/2c. A. Martinez, 3472th Tech. Tng. Sqdn., Box 111, F. E. Warren A.F.B., Wyo.

John Wedlock, Box 48, 111 S. Elmwood, Peoria, Illinois.

Louise, WN3WRE, has learned things since getting her Novice license: "Dear Herb, At last I understand that smile with which a full-fledged operator greets an eager Novice. At first I thought it was a friendly, 'welcome-to-the-brotherhood' smile, but I now know it says 'Just you wait; you'll see.' And I have seen! So far, I've managed to avoid shocking myself or getting burned by the soldering iron. But I have spent time on my tummy in the air space above this apartment inching antenna wire through a rubber hose to the outside. My bridge club has practically thrown me out. I trumped my partner's ace, while waiting for a phone call from Bill (her husband, WN3WRC) to tell me what was wrong with our rig. Bill and I certainly enjoyed our visit to Gary. Bill's brother, W9KRJ, is the best, most patient teacher I have ever met. Through him, those words in the License Manual and Handbook started to make sense. We also enjoyed meeting you. We may be new Hams, but we have been to Mecca! As you know, our transmitter is home made, using an 807 at twenty watts input to a long wire antenna, and the receiver is a converted BC-454. We have plans, but now we are having fun and learning."

Already we have run out of space! Keep your letters and pictures coming. And until we meet again, *Merry Christmas and a Happy New Year.* 73, Herb, W9EGQ.

Attention:

Hamfest Publicity Committees

The Editors of CQ must candidly report that the publication of Hamfest and convention notices has been pretty much of a catch-as-catch-can proposition throughout the past several years. Practically all notices that were received were set in type. However, space allocations during the "make-up" of the magazine often as not dictated that a large number of such notices would be dropped.

Frequently notices about Hamfests were received too late to be included in the proper issue. The length of the announcements varied over extremely wide limits while many were garbled in hopes, we assume, that the Editors would straighten them out and make them readable. The end result of the handling of the convention and Hamfest announcements was a feeling by many groups of being "slighted."

To apply a little practical psychology and to make these announcements somewhat more valuable we are bringing to the attention of Hamfest and Convention Publicity Committees that notices will only be published in 1954 in the "Classified Ads" section of CQ.

A special insertion rate has been prepared and is 25 words for $1.00 and 25 to 50 words for $2.00. No special discounts will be granted for fractional ads. All convention or Hamfest ads will appear under a special heading. Address your announcements to: Classified Ads, CQ Magazine, 67 West 44th Street, New York 36, N.Y.

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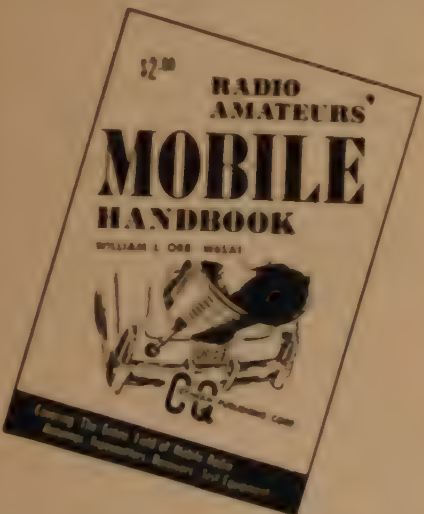

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The F.B. Antenna

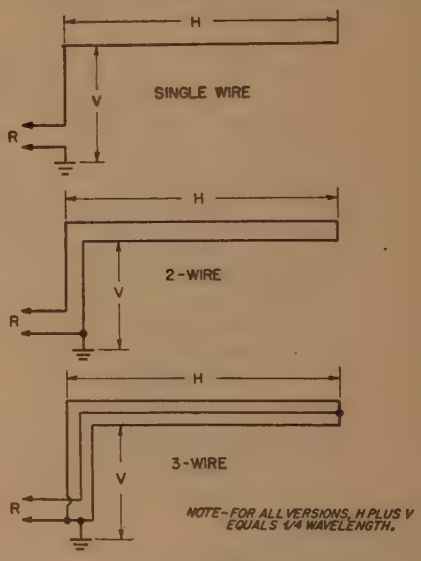
CAPT. R. R. HAY, USN, W4LW

414 New Hampshire Ave., Norfolk 8, Va.

This Article Brings to Light Some Important Information on the "Folded-Bent" Type of Antenna for the 80 and 160-Meter Bands.

Extensive use has been made of multi-wire antennas of the "folded" type. The most common is the half-wave folded dipole. Although this antenna is quite simple and effective, its physical dimensions for the 80 and 160-meter bands are greater than the average householder can lay title too—unless it is straight up.

A number of publications[1, 2] and articles[3, 4] have appeared in the literature describing multi-wire, quarter-wave vertical antennas. These are also known as folded "unipoles" or "monopoles." Generally speaking, a two-wire antenna is recommended for matching a 150-ohm line and a three-wire antenna is recommended for matching a 300-ohm line. Since the quarter-wave antenna is not recognized as a worthy horizontally mounted radiator the question falls back to finding a suitable vertical support—Once again, something that the average Ham is hard put to find.



NO. WIRES IN ANTENNA	FEEDER LINE	VERTICAL DIMEN. AS % OF TOTAL LENGTH
3	52 OHM COAX	22%
3	72 OHM COAX	27%
3	300 OHM TWIN-LEAD	78%
2	52 OHM COAX	36%
2	72 OHM COAX	44%
2	150 OHM TWIN-LEAD	100%
1	TWO 52 OHM COAX LINES IN PARALLEL	60%
1	TWO 72 OHM COAX LINES IN PARALLEL	100%

Table I. Suggested antenna and feedline combinations.

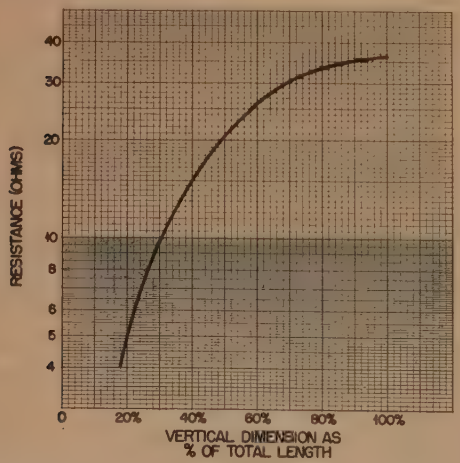


Fig. 1. Theoretical base resistance of a quarter-wave antenna as a function of its total length.

The Bent Antenna

Several years ago, W. C. Babcock[5] discussed the effect on antenna radiation resistance when a vertical antenna is bent into an inverted-L shape. The graph shown in *Fig. 1* summarizes

(Continued on page 61)

1. John D. Kraus, "Antennas," McGraw-Hill Book Co., first edition, articles 14-14, 14-15.
2. W. W. Smith, "Antenna Manual," Editors & Engineers, Ltd., p. 174.
3. W. van Roberts, "Input Impedance of a Folded Dipole," RCA Review, June 1947, p. 289.
4. James W. Hunt, "Grounded Folded Dipoles," QST, April 1949, p. 28.
5. W. C. Babcock, "Mobile Radio Antennas for Railroads," Bell Telephone Laboratories Record, May 1949, pp. 172-175.

THE FB ANTENNA

(from page 58)

his findings. Briefly, the antenna radiation resistance at the feed point is a function of the

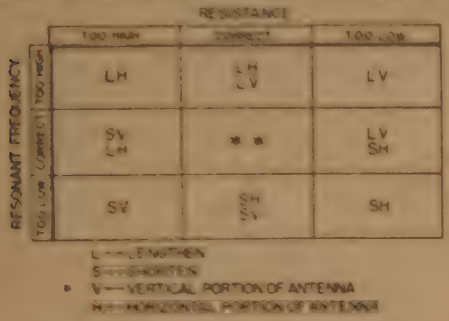


Table II. Once the value of radiation resistance has been determined the remedial step to correct any mismatch is shown above.

percentage of the total vertical length. When 100% of the antenna is vertical, the resistance has a theoretical value of 36 ohms. As the antenna is bent to a horizontal position, the resistance is gradually lowered.

Although Babcock's work was done in the v.h.f. portion of the spectrum there is every reason to believe that principles involved may be applicable to lower frequency antennas. In fact, it is worthy of consideration that a number of recent antenna developments were based upon "models" and experiments in the u.h.f range.[6]

Matching Techniques

In order to match our more-or-less standard transmission line impedances to "bent" antenna, we should be prepared to take advantage of the impedance multiplying features of the multi-wire antennas. For example, a two-wire folded antenna will give a 4:1 impedance ratio, while a three-wire folded antenna will provide a 9:1 impedance ratio. The combination of both "bending" and "folding" the antenna should furnish us with a wide range of values with which we can match the impedance of many different types of transmission lines. An antenna employing these features has been christened the "FB" (folded-bent) antenna.

Various combinations of antenna dimensions and feedlines are suggested in *Table I*. It should be remembered that the theoretical dimensions are based upon the assumption of a perfect ground plane. In practice, the virtual ground plane may be some distance below the soil surface. Also, the associated losses in the ground system may add to the radiation resistance and produce a value higher than the theoretical value.

(Continued on next page)

6. D. C. Cleckner, "Parasitic Beam Patterns," CQ, July 1948, p. 25.

(from page 61)

Any antenna derived from the data in *Table I* must be checked for its value of radiation resistance with an *Antennascope*[7] or *Matchmaker*.[8] Once the resonant frequency and radiation resistance are known, appropriate remedial action may be taken by consulting *Table II*. For example, an antenna is intended to have a resistance of 72 ohms at a frequency of 3680 kc. Measurements show that the resistance is 100 ohms at the resonant frequency of 3490 kc. The action indicated by *Table II* is to shorten the vertical portion of the antenna (about 5% would be a good guess) and then take a new set of measurements. Continue until the desired values are reached.

The spacing between the elements in an "FB" antenna does not appear to be critical. At W4LW a six-inch spacing has been used in open wire two- and three-wire versions. Probably the familiar twin-lead could be used as well in the two-wire configuration.

The principal merit in the "FB" antenna lies in its convenient dimensions for the 80 and 160-meter bands. It is also somewhat broadbanded and affords a degree of lightning protection because of its grounded construction.

7. W. Scherer, "Building and Using the Antennascope," CQ, Sept., 1950, p. 13.
8. W. I. Orr., "The Matchmaker," CQ, December 1951, p. 27.

Our Cover

The ultra-suave station at the QTH of W6GVY, Paul Giganti, of San Carlos, California. The body of the cabinet was built of plywood, and the doors of combed Philippine mahogany, for about $100.00. Housed within is PP oscillator (6L6's—CQ, March '53) driving a pair of 807's in PP final with 6Y6 clamper tube, for input of 135 watts on 40 CW. This decor was necessary to establish complete rapport with XYL.

Broad Band . . .

(from page 33)

DEER HON. ED.

Yesterday I are bying copy of latest CQ Mag and are immejutly looking for my good friend Scratchi in his usual place behind front cover. Scratchi are give menny 1/c fine bizness suggestshuns in past years. But, Hon. Ed., insted I are meting face to face with sum guy . . . who are hammed up M. Burl cumplete with corny dialog.

Pleeze Hon. Ed., bring Scratchi back for evry month.

RICHIE LIKASCRATCHI

Needham, Mass.

Editor's Note: It's interesting to me that after spending a little over two years listening to people gripe about Scratchi and how horrible it was to note that my desk is deluged with mail favoring his immediate monthly return. What happened to all those that wanted "anything, but Scratchi?"

YL's FREQUENCY

(from page 47)

meeting had been planned but D/C W6JMS couldn't get down so the meeting was an informal get-together. Everyone enjoyed a talk by Director W6KW on old-time radio and the need for Hams to "hold together." At the breakfast W6MFP, Agnes, won a clock-radio. We let some of the OMs in on the drawing, too, (they'd fared so badly the night before!) and K6DK won a TV lamp.

YLs in the News

Much as we'd like to, there isn't space enough here to tell about all the YLs we met. A few highlights: DX gal W6UHA is up to 214 countries, 193 confirmed. She is DXCC, holds WAZ 140, and WBE on phone and CW. Treasured bit of "cardboard" at present is a gold-lettered QSL from HZ1TA, Prince Talal of Saudi Arabia. Maxine says her postman bowed low as he presented it with her mail! W6QOG, Helene, is up to 172 countries (161 confirmed) all on two-way phone, using 6MBD.

Traveling L.A. club member W6NZP, Evelyn, was at the time of the convention in South Africa, where she visited ZS6GH, Diana, and other ZS Hams. W6NLM was about to start packing for a move to Washington, D.C., the first of November. Beulah's OM, 6PCU, is with the FCC. The L.A. YLs will miss Beulah. She has been active in the club on the nets and she and 6CEE, Vada, worked hard on the convention committee.

W6LBO, Mary, has been working as a reporter for the **South Bay Daily Breeze.** She is NCS for the all-YL 2-meter net. W6MFP, Agnes, who started Hamming as W2JZJ, finds another interesting hobby in ceramics.

W6DXI, Gladys, had been on the air only a week but was already checking in on the Monday night Glendale CD net, Tues. Golden State (emergency) net, and Wed. YL 2-meter net. W6QLM, Dot, was one of the first licensed YLs in L.A. when she was on 160 meters. Now she

(Continued on next page)

(from preceding page)

likes to handle traffic on the Mission Trail net.

A special guest of W6UHA at the luncheon at Bullocks was the XYL of ex-PK6HA (a prisoner of the Japs in the war and now an SK).

W6QGX, Harryette, met her OM, 6QGP, when she was W9KSA and was working as an engineering aide in Ohio where he was an engineer. Now they have three little jr. YLs, but she finds time to get on 2 and 75.

When W6QYL checked into the Wed. 75-meter net she identified herself as a "YLRN"—and that's just what Martha is, a nurse.

W6GAI, Frances, holds a maritime-mobile certificate. Though the openings on 10 are scarce, she's always watching for more M/M's. Frances' OM is not a Ham, but her son is 6ZJU.

WN8MHE, Wanda, was visiting her brother, 6EXW. W8HPO/6, Ernestine, is now at Santa Barbara where she's active on 40 CW.

Our hostess, W6WRT, we first met on 10 meters when she was WØTAB and we were W7OOH. As Ruby remarked, Hams really do move around! W6WRT and OM 6UTZ are on all bands with a Viking I. Harl urged Ruby to get started in Hamming and she got her ticket in '41—now she is more active than he. Harl and Ruby also are both much interested in photography. Our thanks to them for all of the accompanying photos—as well as for the many kindnesses in their home.

All good things must come to an end. So, here we are back in W5-land—feeling a little bit like Cinderella—except we do get to keep the prize, the wonderful new station! Our thanks once more to all the W6 YLs who did so much to make our visit such a pleasant one.

CUL es 33, W5RZJ

PROPAGATION CONDITIONS

(from page 45)

Booker, Gartlein and Nicols of Cornell University. Radar reflections from the Aurora, observed at Ithaca, New York on a frequency of 104 Mc., appears to occur only during the type of auroras referred to as ray-auroras, rather than during the arc type*. It has also been observed at Ithaca that reflection takes place only when the signal is directed at approximately right angles to the rays. Dr. Booker interprets these observations as indicating that radio reflections from Auroras are produced when the signal is scattered from the numerous ionized aurora trails that make the ray-type aurora. This type of reflection is quite similar to the reflections that take place from meteor trails.

The Stanford University propagation research group of Villard (W6QYT), Peterson (W6POH), Manning, Helliwell and Von Eshman, etc., have been responsible for a number of recent investigations of considerable interest to the scientific world and of particular interest to Amateurs. They have been responsible for the creation of such new words in the amateur language as "Selecto-ject," "Scatter-Sounding" and "Meteoric Scatter," etc. They now come forward with a new one called "Whistlers." "Whistlers" is the title of a paper presented by Helliwell. This term denotes a relatively rare audio frequency phenomenon believed to be caused by the propagation mechanism of impulse atmospherics. Whistlers may be heard by means of a sensitive audio amplifier connected to a long wire or loop antenna. They resemble a rough whistling tone, with varying degrees of "musical quality," which descends in frequency from several kilocycles to a few hundred cycles in an interval of about one second. Whistlers may become a powerful new tool both for the study of ionospheric propagation at very low frequencies and for the investigation of the outer ionosphere, at present virtually unexplored. Here again, is a scientific investigation to which amateurs may contribute, since it requires rather simple equipment for observing whistlers. Whistlers occur at a rate of approximately one per hour during the night, and increase somewhat during thunderstorm activity. They are noticed less frequently during the daylight hours. Data regarding the observation of whistlers should be forwarded directly to R. A. Helliwell, Stanford University, California.

Merry Christmas and a Happy New Year to all from —W2PAJ.

* Barnett, "The World We Live In," Part IV, Life,—June 8, 1953.

DX AND OVERSEAS NEWS

(from page 43)

After all these years John got on with a class B modulator which accounted for VB1FE . . . Alfredo, CE3DZ adds nine to reach 212 while Pierro, FB8S, goes to 232 with VK1JC, ZC5VS and SVØWF/Crete . . . Howy, W2QHH, made it an even 220 with VK1RL. He also nabbed PZ1WX on 3.5 for No. 104 and LB8YB on 7 for No. 107 . . . VK4FJ upped to 205 with MP4ABW, A3, Qatar. Stan also hooked KC6AA, Yap, and FW8AB on Wallis . . . Ev, KP4KD, went to 204 with ZK1AB while W2BJ kept just behind him by grabbing LB8YB for 203 . . . W6LGD presents CEØAA for his No. 153 while W3LVJ's revised list drops him from 158 to 157. Diogenes please note!

W4EPA ups to 149 with 9S4AX, ZD4BJ and I5LV . . . W2ZV8 hits 160 with LZ1KPZ and KB6AY . . . Sam, W3AXT, adds another nose with FB8BE for No. 143 . . . Jim, W8FXN, goes to 160 with LB8YB, GD3UB, ZC5VS, VK1BA and I5LV while Ned, W1RAN, reaches 146 courtesy of VK1NL . . . W2HAZ reports in with GD3UB for No. 113 . . . HC2JR, John, adds 4 to his "phone only" to hit 175 while PY2JU comes up to date with 37 phone additions to rest on 140 . . . VK3FH, via W8OCT, reports working FW8AB, 14100, 2300 GMT.

JOINT DX CONFERENCE

The 8th (AND GREATEST) Joint DX conference of the Northern and Southern California DX Clubs, sponsored by the Southern California DX Club, will be held on January 16th and 17th, 1954 at the Hotel Californian, Fresno, California.

DX men from everywhere are cordially invited and urged to attend this real, old fashioned DX round up. Things will start happening at 3 o'clock Saturday afternoon: the banquet should start about 8:30 PM; several prominent, selected speakers will bring a few thousand words, and the Polynesian Room, well . . . it closes late. Sunday breakfast, if you want any, will be informal.

Drop a line to W6ENV, 4539 Beck Ave., North Hollywood, Calif., telling of your intention to join the gang. Hotel accommodations may be requested at the same time, or handled directly with the hotel in Fresno.

Sundays but says he is quite QRL with commercial radio . . . KV4AA was No. 106 for OH6PT and No. 103 for OH6QZ . . . W3EWR added two with TG and LU4ZS . . . HR1AT, Oscar, added three new ones in TF3, GC4 and EI5 . . . W5AVF added I5LV, VK9YY, MP4BAU (Qatar), VK9GM (Norfolk Is.) and FK8AO . . . VP8AN's first W phone was W8JBI, No. 2 was W8MPW . . . WW6BN, Wake Island, started off with a decided bang. His first QSO was with KV4BB on 7176!! . . . ET2AB reached out and pulled in VE3AW . . . W9KXK received WAA Certif No. 89.

W3CHH nabbed SU1SS, HA2CJ and TA3AA. All on the low end 7 Mc . . . CP1BX, with new Globe Champion rig, hooked OQ5VN for No. 80 . . . G3IGZ keyed with BU8AA at 1000 GMT, 010 . . . GM3EBT hit 109 with MP4ABW and SVØWG (Rhodes) . . . Mel, KZ5EM, starts up the DX ladder with such as F9, SM6, PAØ, ZL, OK8, LU1, FP8 and EI6 . . . Congrats to Art, G2MI, who has been nominated by the Board to serve as RSGB President for next year. Art nabbed MP4ABW for No. 208. Stan, G8ATU, will take over Art's old chores of writing "Month On The Air" . . . W6QHS, Dave, reports some 14 CW catches as follow: VP3YG, VP6PV, VP9BM, VK9GM, VK9YY, ZK2AA, DU7SV, KS6AB and FP8AP while phone accounted for FO8AD, VR2CG, KJ6BA, KX6AY, OX3BD and VP7NB . . . Guy, W1DHO, went to 89 with KG6FAA, HK5DH, HH8DM, CEØAA, G8GDW/VS7BJ and EA9AP . . . K6AHV's twenty-watter hauled in 20 countries during his first month's operation on 14 Mc. among them being DU7, HR1AA, KC6AC, KX6BF and KR6GR . . . VE3IG's 3.5 Mc. efforts, after de-TVI success, brought forth contacts with PZ1WX, ZL1CI, KL7PI, ZL1BY, KH6PL, DL1DX and FA8DA. Hal has nabbed seven YV's but nary a QSL! . . . Congrats to

(Continued on next page)

(from preceding page)

VP9BF and XYL on Jr. op's arrival on Columbus Day . . . With assist from VK4FJ, VR4AE was cornered by KV's 4AA, 4AQ, 4BB and TI2TG. 14010, 1130 GMT.

Honor Roll Endorsements

CW/PHONE		F8BS	39-232	W3WU	37-162
W8HGW	40-253	W2WZ	39-229	W4EPA	37-149
G6ZO	40-247	4X4RE	39-225	OE1FF	37-144
W2BXA	40-246	W2QHH	39-220	W6YK	37-144
PY2CK	40-244	W1HX	39-217	W2ZVS	36-166
G6RH	40-244	W9FKC	39-211	W3AXT	36-143
W6AM	40-242	W4GG	39-211	W5FXN	35-160
W3KT	40-242	W3DKT	39-210	W1RAN	35-146
W8NBK	40-241	VK4FJ	39-205	W6ZZ	35-136
W3EVW	40-241	KP4KD	39-204	W2HAZ	35-113
W2AGW	40-240	W2BJ	39-203		
W6SYG	40-240	W9HUZ	39-197	PHONE ONLY	
W6VE	40-220	VE3AAZ	39-192		
W6CYI	40-214	W6LW	39-192	PY2CK	39-222
W6EFM	40-214	W9ABA	39-174	G8IG	39-183
CE3DZ	40-212	W6LGD	39-158	W2BXA	38-200
G8IG	40-211	W9ALI	39-136	W1MCW	36-200
W6PZ	40-170	TI2TG	38-212	TJ2TG	36-179
W6NZ	40-148	W3LVJ	38-157	HC2JR	35-170
W6ID	40-143	W6ETJ	38-144	W3EVW	35-163
W6BIL	40-136	W6KYG	37-200	PY2JU	35-140
W8KIA	39-237	KP4CC	37-191	W3KT	34-164

Last complete HONOR ROLL appeared in the September issue.
Next complete HONOR ROLL appears in the January issue.

Fifteen Meters

To the DX'er who has not, as yet, put his heap i 21 Mcs. we can only say "Brother, you're missing a lo of fun." This band has been hotter than a firecracke on weekends with all sorts of stuff showing up. Wha to expect may be noted from the following reports, bu first:

> Our heartiest congratulations to Lindy, W8BHW, who, to the best of our knowledge, has been the first to contact 100 countries on this band. A QSO with a KL7 turned the trick. 700 watts is run at W8BHW and the labor that went into the construction of his 12 element beam has certainly been justified by results.

The way conditions are and with the steady arriva of new countries on 21 there is no doubt in our min that several stations will have reached the century mar by the time this is read . . . W6ZZ adds VQ2AB an KR6LJ but missed CR4AI and ZB1BR who were dul nabbed by W6TTB, four miles away. Miles progresse on his phone WAS needing only Ky., Neb., Vt. and De

Country Standings, 21 Mc.

W8BHW	108	G2WW	80	PAØKW	65
DL3RM	99	PAØJJ	79	W5VIR	65
VQ4RF	98	G6QB	73	DL7CX	65
DL7BA	91	KZ5IL	72	DL7DF	64
TI2TG	89	W4KRR	69	W2WZ	64
TI2RC	88	KP4KD	69	FF8AG	63
DL7AA	84	DL1FF	68	G2BW	62
DL7AP	84	KV4AA	68	W1BUX	62
G6ZO	84	G2BJY	67	G2YS	61
G3GUM	81	W3AYS	67	G8II	61
GW3AHN	81	W4COK	66	PY4RJ	60

. . . TI2TG jumped to 88 with ZB1BU, YO3RF, CR6AI FO8AD, ET2MK, VP2KG, TG8IH, ZD4BF, GD3ENK KG6AUA, VQ2DT, VP8AJ and YI3WH . . . Jim, YN1AA pulled up to 68 with FL8AU, ZL1AH, VK4FJ, KH6YI ON4PN and KG6AUA while DL7BA went to 91 wit CR7AD, ZD4AE and YV5AP . . . TI2RC nabbed VU2EH A3 . . . W5GEL put up a new wide spaced rotary an nabbed KV4AA for number 1. Bob then hooked 7 mor with such as CP1BX, FA8IH, CE3AX, KP4JE and G2BV . . . Al, W2WZ, resumed activity getting TA3AA CN8MM, CT1QF, OZ9GC and VP5SC to reach 64 . . W5VIR landed YN1AA for No. 52 . . . The CEØAA W4VNE (ex-KP4HU) QSO was the first 21 Mc. conta for each side . . . W6VX went to 51 with FA8RJ . . KV4AA reached 68 with YO3RD, CT1DJ, SP3AN I1BLF/T and VQ3KIF . . . KZ5WZ also nabbed VQ3KI while VK4RJ reports QSO with DU7SV . . . PY2J reports 55 countries on phone only. These include ZS ZD1, 3V8, LX, 4X4 and EA8 . . . KP4KD says the phon boys are much more active on 21 than the key addic

with more countries represented. Ev went to phone and upped to 69 with such as VK3, VP6, HP3, HK4, VP5 and YV1. Ev also reports he hasn't had much luck trying to convince a few W's that the phone band starts at 21,250 instead of 21,200 [illegible] . . . Late word on W8BHW puts his total at [illegible] which include over [illegible] on phone . . . TI2TG reports ST2GL for No. 89 while TI2RC has 88, A3 only.

Here and There

KC6DX, Phil, is now W5ARL. See QTH's. He can supply any missing KC6DX QSL's . . . W6AWT has returned from European jaunt where he visited Italy, England, France and Egypt . . . WØGYL keys at Univ. of Mo. station WØZLN . . . Mac, of DL4AD, is now home at W6GAR . . . KP4AZ reports that HC8GI, A3, 14113, is manned by GI's . . . Ted, CP1BX celebrated his 23rd anniversary. He is now on A3 with new rig, along with xyl Ginny . . . W4IG/3 now ops from Cascade, Md . . . W2WPO keys from F7AX . . . W1FH now runs a 4/400 for a cool KW . . . After a year's layoff, G8FF is now on from new QTH in Cheltenham . . . After twenty years as W6JKH, Paul, W6JKH/2 awaits new W2 call in Rye N.Y. . . . W3PWN visited W2DKF . . . Mirko, YU1AD, has had cast removed from foot and should be on now with new rig . . . VK4FJ awaits AC4NC QSL for WAZ . . . G3GUK, ex-VS9AW, is active with QRP . . . Andy, GM8EST, undergoes lung operation next May. We all wish you the best Andy . . . CP1BX wishes to express appreciation for tfe help to W3FMC, W3PGB, W4SXE and W8OQO between himself and son, Jack . . . Wen, W2PFB, aboard ship at Petoh, Java, reports terrific phone sigs from VU5AB, Nicobar Is., between 14.1 and 14.2. Also heard on cw were KV4AA, KV4BB and KP4KD . . . Peggy, ex-G8HUD is now VS1FY . . . From JA1AA we hear that JA6AD lost entire house, rig, etc. in recent floods in June. He seeks replacements on QSL's . . . Doc Westervelt, ex-W4VE, now, happily, moves to KR6. He will try to get the call of KR6AA. See QTH's . . . From the So. Cal. Bulletin we learn that Bill, ZK2AA, has been QRL tracking down the murderer of the Resident Commissioner there . . . Dan, ex-W5LVD, now ops from K6CIT running PP 304TL's . . . We wish to correct a statement made in an earlier issue to the effect that the U.R.E. (Spain) has been receiving dollars along with EA9DC's QSL's. Only one dollar was received, from W2GT, and this was immediately returned to him . . . PZ1WX should now be on his way back to PAØWX. We will miss Ger on 3.5 Mc . . . W5BNO reports hearing two FK8AO's on 090, 1910, 9/14. Hope you picked the right one John! . . . W[illegible] has been giving FM7WN a helping hand with parts and has also dispatched the following xtls to ZC5VS 7025, 7055, 7090 and 7284. Guess I'll never find Hugh now, George!! . . . From KV4BB we hear that VK5RG (ex-VK1RG) and VK1AF are brothers (in-law). They swap rigs and QTH's!! . . . W5IRP dropped in on KV4AA for a visit . . . W8PQQ's new duties as S.C.M. for W. Va. cut a big swath in Al's operating time . . . A swell time was had by all at the recent New England DXCC get-together in Cambridge, Mass. on Oct. 15. Forty OM's and two YL's were present at the dinner giving representation to all the N.E. states. W1ATE gave an interesting talk on his two element 7 Mc. rotary beam and W1JOJ distributed QSL cards. Among the many present were W1's HA, HX, TW, ZD, ADM, BLO, FH, BOD, DSF, KKP, LMB, MCW and FTJ/BFT.

Latest QSL Addresses

FK8AO— Geo. Birepinte, Box 104, Noumea, New Caledonia.
FW8AB— Andre Monjoie, P.O. Muta Utu, Wallis Island, Oceania.
ex-KC6DX—Phil Crockett, W5ARL, 205 Maple, Gallup, New Mex.
KR6— ex-KA9AA/KA2AA-Col. F. B. Westervelt, Ryukyus Comm'd. APO 331, S.F.
SVØWE— Sgt. Andrew Sweder Jr. USASG, APO 206, P.M. New York.
VU2CR— Maj. D. Freemantle. No. 2 AF Sigs. Trimulgherry, Deccan, India.
W7IIS/KP6/KB6— Via W7IIS, 2204 NE 7th. Portland, Ore.
XW8AA— Lebailly Radio, Vientane, Laos, Indo-China.
ZC5VM— Brian Mills, RAF Detachment, Labuan, Br. North Borneo.

Thanks to VK4FJ, W5FXN, KP4KD, W2PFB, W5BNO, F9RS and West Gulf Bulletin.

BEST WISHES TO ALL FOR A MERRY XMAS AND HAPPY AND PROSPEROUS NEW YEAR! DICK, KV4AA

CLASSIFIED ADS

Advertising in this section pertains to amateur radio activities. The publishers of CQ do not guarantee any product or service advertised in this section.

RATES: 25c per word per insertion for commercial ads;
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Remittances in full should accompany written copy. No agency or term or cash discounts allowed. CLOSING DATE: the 25th of 2nd month preceding publication date. WRITE: CQ Magazine, 67 West 44th St., New York 36, N.Y. Attention, Jeanne C. Gillespie.

"Christmas Stocking" List:

ABSOLUTELY DAZZLING. The most beautiful call letter plates ever offered. A perfect Christmas gift. Mounts on auto license or in shack. Brilliant colors laminated in crystal clear plastic. Standard size with call letters only—$1.50. Large size with call letters, town and state—$2.00. Specify white or black letters on red, green, blue, yellow, black or white background. No C.O.D. Please order early as these plates are very popular. Dayton Plastic Products, Riverdale Box 98, Dayton, Ohio.

YOUR PHOTO ON STAMPS—Stick onto your QSL's. Send any size photo or negative (returned unharmed). Sheet of 100 glossy photographs, perforated, gummed backs—stamp size $1.50, double size $3.00. W6MFP, P.O. Box 4624C, Los Angeles 24, California.

ALUMINUM CALL SIGNS. Regular or Jumbo, day and night reflecting letters, speedy overnight service, $1.50. Whitley, W2LPG.

MAP PINS—Six Merry Colors—red, blue, brown, orange, yellow, green. Give preference. Fifty in cellophane bag. Robest Products Co., 701 Dewey Street, Harvard, Illinois.

CALL LETTERS: Attractive 2 in. letters, heavy gloss paper, black or white, use anywhere. 25c per set; 5 sets, $1.00. Nickeon, Box 272, Cincinnati 1, Ohio.

LAPEL PINS—White on black background, plastic, ⅜" x 1". Neat and professional looking. Your call engraved. 85c. W2SPV, 4309 Willis Avenue, Merchantville, New Jersey.

FOR DXers—"Ham Interpreters," Ham words and phrases translated into seven languages, $1.00. For SWL's—"World Radio Handbook," complete information on international stations, $1.50. For SWL Novices—"How To Listen," 40c. World Radio Publications, 47 Mounthaven Drive, Livingston, New Jersey.

QSL Cards:

QSLs of DISTINCTION! Three colors and up. Samples? Uncle Fred, Box 86, Lynn, Pennsylvania.

QSLs??? Samples 10c. Sackers, W8DED, Holland, Michigan.

QSL's, SWL's. High quality. Reasonable prices. Free samples. Write, Bob Teachout, W1FSV, Box C124, Rutland, Vermont.

QSLs! QSLs! Wide Variety! High Quality! Fast Delivery! Samples 10c. Tooker Press, Lakehurst, New Jersey.

QSLs. HIGH QUALITY, fair prices. Samples? W7GPP, 1380 F, The Dalles, Oregon.

QSL's-SWL's. Excellent quality. Fair prices. Samples 10c. Almar Printing Service, 602 Barker Bldg., Omaha, Nebraska.

QSL's—"Brownie" W2CJI, 3110 Lehigh, Allentown, Pennsylvania. Samples 10c with catalogue 25c.

Personals:

RECORDING HAMS—Join world-wide tape club. Swap tapes and make friends everywhere. Details free. P.O. Box 1404-C, San Francisco, California.

INTERESTED IN WORKING YL 16-18 years old. Willing to build high-power rig, if necessary, to work someone my own age. I am 18½ years old, 5'9", brown hair and eyes, 145 lbs. Write Box SK, CQ Magazine.

For Sale:

FOR SALE: Teletype machine, Model 26 with keyboard in perfect condition. Quiet and compact, ideal for radio work. Immediate delivery: $225. American Radio Teletype Society, 1379 East 15th Street, Brooklyn 30, N.Y.

FOR SALE: 20-meter, 3-element, "T" match, HyLite beam $50.00 or best offer. FOB. Roger Aden, W9UZP, Golden, Illinois.

NC240-D RECEIVER, includes speaker, little used, excellent condition, satisfaction guaranteed, $185; six unused 304TL's $4 each; four unused 810's $8 each, standard tube warranty. W9SQZ, 2236 Chestnut Street, Fort Wayne, Indiana.

FOR SALE—15-watt 2-meter Motorola transmitter complete with tubes and dual 400v. 150-ma. vibrator supply. 6v. input, less crystal $50. each. WØDOA, RFD #1, Box 319, St. Louis 24, Missouri.

SELL: 21A Teletype tape printer, $49. Receiving distributor, $45. #12 Printer only, $50. 12,000 ohm d.p.d.t. relays $1.75. APR-5A, $150. APA-10, $145. Tom Howard, W1AFN, 46 Mt. Vernon Street, Boston 8, Mass. RIchmond 2-0916, 2-0048.

SELL: SCR522 power supply 110 v. a-c input, 300 v. d-c 200 ma., 150 v. d-c bias, 6v. a-c, 12 v. a-c with tubes, fuse, pilot. $25. FOB. WØGLN, 7507 Lowell, Overland Park, Kansas.

FOR SALE: BC610, final modified to use a 4-250, complete with all tubes, two extra 500-ma. chokes and one 4-250. Best offer over $300 takes all. All correspondence answered. Cash and carry preferred. Also have a Sonar MB-611 10-meter transmitter—$25 takes it. W. L. Haskell, W2ILY, 63 Hope Place, RD 3, Baldwinsville, New York.

SELL: Millen transmitting equipment, meters and many parts. Write for list. W3TDC, 650 - 8th, Oakmont, Pennsylvania.

HQ129-X RECEIVER and SPEAKER. Late model, like new. $135. Harold Denny, R4, Washington, Indiana.

REAL BARGAINS: New and reconditioned Collins, Hallicrafters, National, Hammarlund, Johnson, Elmac, Gonset, Babcock, Morrow, RME, Millen, Lysco, others. Reconditioned S38 $29, S40A $69, S40B $79, S27 $79, S76 $129, SX42 $179, SX62 $179, NC57 $69, NC125 $129, NC173 $149, NC183 $199, NC183D $299, VHF152-A $49, HF-10-20 $49, HQ129-X, HRO Sr, HRO50, HRO60, SX71, HT9, 75A1, 75A2, 32V2, Vixing I, many others. Shipped on approval. Easy terms financed by us. Write for free list. Henry Radio, Butler, Missouri.

SELL: HQ129-X receiver, has had very limited use and is in perfect condition. $140. W. W. Barkdoll, Box 739 Rt 4, Kenosha, Wisconsin.

SELL: HQ129-X receiver with speaker—$125. VHF152-A $50. Louisa Sando, W5RZJ, 959-C 24th Street, Los Alamos, New Mexico.

FOR SALE: BC375 converted 80, 40, power supply, 200 watts fone, CW, $60. BC453 Q5er $8. BC455 $5. BC457 $6. BC654, power supply, final converted 60 watt, crystal 80 m. final case, diagram, $40. N.R.I. experimental kits, instructions, battery VTVM working $40. Hallicrafters HT17, coils all bands instructions with 25w. power supply. Tunes any antenna length $40. RCA 9T284 10" TV pix zoom, Standard tuner, works fine $70. Wanted: Heath 0-8 scope, Heath sweep generator. W2ZAR, George Nicholls, 603½ North Cayuga Street, Ithaca, New York.

FREE LIST. New and reconditioned receivers, transmitters, etc. A hundred big bargains every month. Highest trade-in allowance. Fast four-hour shipping service. Special Novice department. Write today. Dossett, W9BHV, 855 Burlington, Frankfort, Indiana.

ARC-4, complete with rack, meter, tubes, 2 twelve-volt batteries, cables, good charger. $40. W6SUF, 357 North Florence, Burbank, California.

FOR SALE: ART-13, not modified, perfect condition, $175. BC224-B converted to 110 v.a.c. $65. BC348-Q 110 v.a.c., very hot receiver, $75. BC459-A $10. Two BC645-A's brand new $25 for pair. RME VHF152-A good condition $45. RME HF-10-20 like new $45. Millen R-9er $15. National Company 1" scope $10. Will pack and ship. Wayne Phelps, W5OQK, 26 North Wynden Drive, Houston 19, Texas.

VIKING OWNERS, are you interested in remote control with push-to-talk and receiver quieting circuit? We can do this for you; send for special bulletin. We can also incorporate above features in new orders for Viking II wired and tested. We can also supply these transmitters with a 4D32 final, or modify yours; write for details to W1BFT, Evans Radio, Concord, New Hampshire.

For Sale:

HALLICRAFTERS HT-20 All band transmitter 100 watts. Used approximately 6 hours. Cost $449.50. First check for $325. takes it. Also complete Brumeco 10 M mobile rig. Wm. Rossi, W2OGL, 249 Bay Street, Staten Island 4, New York.

UNFORESEEN EMERGENCY at me. All new gear for sale. Johnson Viking II transmitter with VFO both wired. Latest Hammarlund HQ-129-X receiver with speaker. Buyer pays shipping. Joseph R. Lebo, W2OEU, 145 West 88th St., New York 24, New York.

ONE FULL KW TRANSMITTER PP 4-250A complete with speech, modulator and power supplies. All you need is the antenna. TV1 provided. SCR-522 used for exciter and standby 100-watt transmitter. Price $1250. W9ILH, Carrie Jones, 606 East 5th Street, Alton, Illinois.

BARGAINS. Extra Special: Motorola P-43-32 mobile receivers $19.50; 32V1 $395; Globe King $299; HT-9 $199; Supreme AF100 or Temco 75GA $225; HRO-50 $275; 75A1 $250; SX-71 $169; S-76 $149; SX-42 $189; SX-43 $129; HRO-Senior $90; RME 2-11 $99.50; RME-45 $89; EX Shifter $69; S-40A $75; BX-16 $69.50; VHF-152 $49; HF-10-20 $59; Globe Trotter $69.50; MB611 mobile transmitters $14.95; 2-meter exciter $24.50; 10M-6-10 meter converter $19.90; AE-1a $14.95; Gonset 10-11 converter $14.95 and many others. Free trial. Terms financed by Lee, W9GFQ. Write for catalog and best deal to World Radio Laboratories, Council Bluffs, Iowa.

NATIONAL NOIX RECEIVER $60. 7" TV $30. 10" $40. Want SB-10 Exciter. W4APL, 1420 South Randolph, Arlington, Virginia.

GONSET 2-meter converter $25 or W3SPV.

USED WESTERN ELECTRIC 2-B rectifier, 220-volt, three-phase, 60-cycle, good electrical condition; secondaries: -200 volt bias; two high voltages, 1000-1150 d.c., 2000-2900 d.c. at 600 ma. each. 10-volt ac at 31.5 amperes, conservative Western Electric ratings. Bias and high voltages separately fused and metered. Uses seven 249B or 872A rectifiers. Less tubes. Wt. 665 lbs. Size 2' 2" x 2' 1" x 22". All inquiries answered. Right reserved to reject offers. Best offer over $225 takes. Make offers FOB Little Rock, Arkansas, W. Charles Webster, W5WEF, 21 Shannon Drive, Little Rock, Arkansas.

COMPLETE 300-WATT ALL BAND fone CW transmitter for sale, $13 final, Meissner Signal Shifter VFO, $300 or best offer, must sell. W4PJG, Box 647, Fort Myers, Florida.

SX-71, like new, $150; BC-459, unmodified, $15; SCR-625 mine detector, complete, $35; New surplus F-15/U 2KW low pass filter, $5; five new BC-366 jack boxes, $ .50 each. Wanted: ART-13 transmitter and parts. W1KJO, 29 Pine St., Bedford, Mass.

MILLEN R9-er with 6-meter coil. $6. Box GF c/o CQ Magazine, 67 West 44th Street, New York 36, N.Y.

Wanted:

WANTED: BC348-R, $110; BC348-H, L, K, $90. Also APN-3 and CPN-2 equipment. All test equipment and radar gear. Radalab, Inc., 87-17 124th St., Richmond Hill 18, N.Y.

WANTED: Pair 304TLs; power supply parts. W8LSA, 1108 Clearview Avenue, Parma, Ohio.

WANTED: Complete sets or parts for Wireless Set 19 Mk II or III. Advise best price and condition first letter. Montgomery, 7315 Varna Avenue, North Hollywood, Cal.

WANTED: ART-13 or parts. Also fixed frequency receiver mobile or a.c. Must be on or close to 10 meters. Give price and condition. W9NAT, 617 Monroe, Evansville, Indiana.

WE NEED USED RECEIVERS: We give highest allowances for S20-R; S40-A, B; NC-57; NC-100; NC-125; SX-24; SX-25; HQ129-X; and similar receivers. World Radio Laboratories, Council Bluffs, Iowa.

WANTED: Low frequency Navy receivers, Type RBL 15-600 kc. Frequency meters, Type BC221 all suffixes. Advise price, condition and modifications, if any. Amber Co., 393 Greenwich St., New York 13, N.Y.

WANT: AN/ARC-1's, AN/ARC-3's, BC610-E's and components: Write B. Spivey, 7013 Rolling Road, Chevy Chase, Maryland.

WANT: Technical Manuals, SIG-5 catalogs, Collins 310B or other Collins VFO, 32V2, 32V1, ART-13, CU-25, CU-32, DY-17, BC348-R. Will trade. Tom Howard, W1AFN, 46 Mt. Vernon St., Boston 8, Mass. RIchmond 2-0916, 2-0048.

Wanted:

WANTED: BC-610 with speech amplifier. Send full information first letter. Montgomery, 7315 Varna Ave., North Hollywood, California.

WANTED: BC348-R, BC342, BC312, APN-9, BC610-E, R-390-A, BC729, BC614-E, Collins 32V-2, 32V-1, 75A-1, 51J-3, ART-13, DY-17, CU-25, CU-32, BC-221, LM, TCS, GN-58, Teletype, AR-88, manuals. Will take any electronic equipment in trade for new amateur equipment. Alltronics, Box 19, Boston 1, Mass. RIchmond 2-0048, 2-0916.

WANTED: Mobile transmitter, Babcock, Viking or other make. At least 40 watts input. Gonset or Morrow mobile converter. Also wanting model radio control transmitter and receiver complete with escapement. Also good used 16 MM movie camera and projector. Write, VE5EA, Davidson, Sask., Canada.

WANTED: Bargain in transmitters, receivers, laboratory and test equipment, power supplies, miscellaneous gear and parts. What have you? Please state price desired. W5ZZ, 718 North Broadway, Oklahoma City, Okla.

NEED: BC348 radio receiver, Hoffman, 1406 G Street, N.W., Washington, D.C.

WANTED: AN/ART-13 transmitter and/or parts. Robert Wegelin, 410 Cedar Street, N.W., Washington, D.C.

WANTED: All types of aircraft radios, receivers and transmitters. Absolutely top prices. W2KUW, 308 Hickory St., Arlington, New Jersey.

WANTED: BC348 receiver and parts. Write James S. Spivey Co., 1406 G Street, N.W., Washington 5, D.C.

WANTED: Feature article material for CQ especially in field of small transmitters either mobile or fixed. We have plenty of material on antennas, RTTY and high power equipment. Contact CQ Editor about payment, rates, etc.

WANTED: Collins 32V-2, accessories for Collins 75A-3 plus other good used equipment or parts. What have you? I have a new Bell & Howell 35MM Foton with case and flash, Stereo Projector and other photographic equipment to trade for Ham gear. W5GGC, 1410 North Whitaker St., Midland, Texas.

Miscellaneous:

ATTENTION RADIO CLUBS! Trade late model pinball machine, original cost $275, ideal for club or game room. Nant tape recorder. S. Cokas, W1ULR, 1 Acorn St., Lynn, Massachusetts.

BEAT TVI! Television interference eliminated with amazing, easily installed, guaranteed, antenna high-pass filter. Unbelievable! Only $1.00 postpaid. BMB Co. Box 8, Hillside Manor Branch, New Hyde Park, New York.

10, 15 & 20 METER BEAMS, aluminum tubing etc. Perforated aluminum sheet for shielding. Radcliff's, Fostoria, Ohio.

PRECISION and Custom-built ANTENNAS for any band and frequency. Literature on request. Antenna, Inc. Wakefield, Rhode Island.

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INCREASE CODE SPEED. Psychological method. Booklet two dollars postpaid. Inquiries invited. D. H. Rogers, Fourth St., Fanwood, New Jersey.

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TEST EQUIPMENT. Repaired and calibrated by factory staff. All makes, Solar, Simpson, Triplett, Heath, etc. Immediate service. Douglas Instrument Laboratory, Norfolk Avenue at Shetland, Boston 19, Massachusetts.

"DX LOG OF AWARDS," the information you have been looking for. Contains the official rules for more than 30 awards with check lists to record your progress. DXCC covers nine pages alone on 8½ x 11 pages. Only one non-DX award, WAS. Contains also, postal data, countries cross-index, list of banned countries and other valuable information. The prepaid price to any country only $1.00, U.S. funds. Write for price if to be sent by Air-Mail. E. C. Frierson, W4RKJ, Hobby Publishing Co., Easley, South Carolina.

INDEX TO CQ

Issues of Volume 9, Nos. 1 Through 12 for the year 1953

Antennas, Transmission Lines, Masts, etc.

Additional Notes on the True-Matcher—Hay July, 30
Antenna Rotation with a Servo-Mechanism—Elwell ..... Nov., 13
Automatic Antenna Changeover—Montgomery ..... Jan., 27
Evolution of a 40-Meter Beam—Leighton ..... Feb., 23
FB Antenna—Hay ..... Dec., 58
Four-Band DX Antenna—Lee ..... Nov., 20
G-String—White ..... Apr., 13
Mail-Order Antenna—Johnson ..... Nov., 38
More on the T2FD—Countryman ..... Feb., 28
Question of a High-Angle Radiator—Mitchell Nov., 29
Some Practical Results on the Question of Antenna Height—May ..... Apr., 38
Simplified Pi-Network Solutions—Hoefer ..... Nov., 24
Ten is ¼ for Ten—Field ..... May, 41
Terrible T and Gamma, Too!—Orr ..... Oct., 15

DX

Certificate Seeker's Directory—Bradley ..... Feb., 34
CW Section Results—CQ World-Wide DX Contest ..... Aug., 28
DX Man's Zoo ..... Feb., 17
Easter Island Expedition—Desmaras ..... Nov., 26
G's Point of View—Thomas ..... Feb., 31
Phone Section Results—The CQ World-Wide DX Contest ..... July, 19
Rules for the World-Wide DX Contest ..... Aug., 36
Story of RV2—d'Assignes ..... Feb., 21
Versed in DX—Montgomery ..... Feb., 42
VK's Point of View—Hine ..... Feb., 43
477,700-Mile DX on Two Meters—Brown, E. M. ..... Mar., 54

Editorials

Vale 12.112—Ferrell ..... Jan., 9
Regulatory Powers and the Amateur Radio Service—Sterling ..... Feb., 9
Edison Radio Amateur Award ..... Mar., 11
World-Wide DX Contest ..... July, 13
ARRL Convention Address—Sterling ..... Aug., 11
Dockett No. 10712—Ferrell ..... Nov., 11

Meters and Measurements

Break-in Monitoring Unit—Woolley ..... Dec., 28
Mobile Calibrator—Scherer ..... May, 57
Novel CW Monitor—Graham ..... July, 38
Subject: Grid Dippers—Brown (E.M.) and Scherer ..... Jan., 12
Test Equipment (Tube Checkers)—Burgess ..... Dec., 23
"What's the Percentage?"—Orr ..... Apr., 33

Miscellaneous

Calling All Hidden Transmitter Hunters—Kuehn ..... Sept., 13
CONELRAD Alarm System—Cosmas ..... Apr., 18
Crossword Puzzle—Snow ..... Sept., 40
DX Man's Zoo ..... Feb., 17
Easter Island Expedition—Desmaras ..... Nov., 26
Effective Radiated Power—Emerson ..... Mar., 56
Field Day is for the Birds!—Ferguson ..... Aug., 42
Hams in Industry—Whitaker ..... Sept., 38
Horace Came Back!—Hileman ..... Aug., 40
How to Profit From Your Electronic Invention—Slick ..... Mar., 24
How to Prune Your Miniductors ..... June, 19
In a Fit of Pique—Hileman ..... July, 28
Men of Radio (Part V)—Wellman ..... Jan., 33
Mobile Madness—Tierney ..... May, 30
Not So Silent SWL—Tierney ..... Sept., 17
Project CONELRAD ..... Apr., 17
Simple Intercom—Marriner ..... Dec., 30
Some Experimental Data on the 6CL6—Rasmussen and McNeal ..... Dec., 28
Taming Parasitics in Your 6146—Marriner ..... Mar., 20
Use a Fuse—Brauner ..... Dec., 29

Modulators and Modulation

Amplitude Modulation Review—Montgomery Nov., 33
Class "K" Modulator—Hileman ..... Oct., 37
"What's The Percentage?"—Orr ..... Apr., 33

Mobile and Portable

Calling All Hidden Transmitter Hunters—Kuehn ..... Sept., 13
Care and Feeding of the Storage Battery—Goffe ..... May, 24
Dial-Less VFO—Graham ..... May, 31
Mobile Calibrator—Scherer ..... May, 57
Go Mobile on 160—Tranberg ..... May, 23
Mobile Installation Briefs—Gertz ..... Nov., 28
Report on the Gonset Converters ..... May, 42
Ottawa Six Meter Story—Davis ..... May, 52
SSB Mobile—Poole, Brown (J.N.) & Ferguson ..... May, 15
Ten-Meter "Handy Talkie"—Luisser ..... July, 46
Ten is ¼ for Ten—Field ..... May, 41
Thirty Watts on Five Bands—Ferguson ..... May, 43
TNS Twin Noise Squelcher—Scherer ..... May, 29
Using Your 12-Volt Dynamotor—Hileman ..... May, 51
VFO Mobile Transmitter (Part I)—Watkins May, 59
VFO Mobile Transmitter (Part II)—Watkins June, 20
W2AEF Converter-ettes—Scherer ..... May, 37
40-Meter Mobile With Your ARC-5—Lee ..... Mar., 62

Monthly Columns

DX and Overseas News—Spenceley . . . Jan., 44; Feb., 48; Mar., 44; Apr., 44; May, 68; June, 37; July, 52; Aug., 46; Sept., 29; Oct., 45; Nov., 30; Dec., 41.
Ionospheric Propagation Conditions—Jacobs . . . Jan., 41; Feb., 45; Mar., 41; Apr., 41; June, 41; July, 41; Aug., 43; Sept., 25; Oct., 40; Nov., 44; Dec., 44.
Mobile Corner
Tri-State Amateur Radio Society—Gehres Jan., 38
Caravan Club—Rountree ..... Mar., 34
Phil-Mont Mobile Radio Club—Bohlander Apr., 25
Portland's 29.3 Net—Holm ..... May, 34
Aug., 51; Sept., 41; Oct., 54; Nov., 48; Dec.,
Monitoring Post . . . May, 66; July, 36; Aug., 27.
Novice Shack—Brier . . . Jan., 32; Feb., 52; Mar., 36; Apr., 48; May, 70; June, 44; July, 48; Mobile Amateur Radio Corps—Trask..June, 32 48.
Scratchi . . . Jan., 4; Feb., 4; Mar., 6; Apr., 6; May, 6; June, 6; July, 6; Aug., 6; Sept., 6; Nov., 6.
Snorlock . . . Oct., 4; Dec., 6.

Teletype—Green . . . Jan., 29; Apr., 28; June, 35; Sept., 18.
VHF-UHF News—Cobb . . . Oct., 42; Nov., 49; Dec., 31.
YL's Frequency—Sando . . . Jan., 31; Feb., 56; Mar., 39; Apr., 51; May, 72; June, 40; July, 44; Aug., 28; Sept., 23; Oct., 50; Nov., 43; Dec., 46.

Novice

Bookcase Transmitter—Haro ..... July, 22
Getting on Novice Phone (Part II)—
Kephart and Brown (E.M.) ..... Jan., 23
Simple, Efficient Station-Control System—
Goodson ..... Aug., 18

Propagation and Predictions

DX and the Sun (Part I)—Jacobs ..... July, 15
DX and the Sun (Part II)—Jacobs ..... Aug., 20

Radiotelephony

Getting on Novice Phone (Part II)—
Kephart and Brown (E.M.) ..... Jan., 23
(see also Mobile, Single Sideband, War Surplus)

Radioteletype

New, Simplified QS-er—Weitbrecht ..... July, 25

Receiving

Flexible I-F Channel Selectivity—Champlin ..... Oct., 31
More on Mechanical Filters—Brown, E.M. ..... Oct., 34
New, Simplified QS-er—Weitbrecht ..... July, 25
"Piggy-Back"—Bishop ..... June, 22
Report on the Gonset Converters ..... May, 42
Super/Super for 144 Mc.—
Brown, E.M. and Kephart ..... Oct., 21
TNS Twin Noise Squelcher—Scherer ..... May, 29
Using The Collins F455-A Filter
Brown, E.M. ..... Mar., 13
W2AEF Converter-ettes—Scherer ..... May, 37

Shack and Workshop

(January 28, 52)
Another Foolproof Switching Sequence
Tinning an Iron with Silver Solder
Call Letter Sign
(March 22)
Variable Voltage Power Supply
Fixed Capacity Final
A Push-to-Talk System
(May 22)
Foot Switch for Mobile Transmitters
(June 25)
A Sidetone Monitoring Gadget
(July 35, 40, 51, 64)
Soundproof Relay Case
Makeshift Dial Index
Inexpensive Identification Labels
Another Auto Relay Application
Absorbent Headphone Cushions
Plugging Panel Holes
Indestructible Neon Bulb Holder
(September 40)
Minimizing Regulator Interference
(October 33, 36, 69)
Simple Squelch Circuit
Eliminating Auto Generator Whir
Quick Heating Soldering Iron
Reflection Call Letter Plates

Single Sideband

Getting Started on Single Sideband (Part 1)—
Brown, J.N. ..... Mar., 27
Getting Started on Single Sideband (Part II)—
Brown, J.N. ..... Apr., 19
Getting Started on Single Sideband (Part III)—
Brown, J.N. ..... June, 27
Getting Started on Single Sideband (Part IV)—
Brown, J.N. ..... July, 32
Getting Started on Single Sideband (Part V)—
Brown, J.N. ..... Aug., 22
Getting Started on Single Sideband (Part VI)—
Brown, J.N. ..... Sept., 19
SSB Mobile—
Poole, Brown (J.N.) & Ferguson ..... May, 15

Television Interference

Collins 310B—1953 Version—Orr ..... June, 13
TVI-Free Transmitter for 40—Marriner ..... Oct., 28

Theory

Amplitude Modulation Review—Montgomery ..... Nov., 33
How To Prune Your Miniductors ..... June, 19
Keying the Kilowatt—Johnson ..... Sept., 33
Simplified Pi-Network Solutions—Hoefer ..... Nov., 24
Subject: Grid Dippers—
Brown (E.M.) and Scherer ..... Jan., 12
Terrible T and Gamma, Too!—Orr ..... Oct., 15

Transmitting

Bookcase Transmitter—Haro ..... July, 22
Collins 310B 1953 Version—Orr ..... June, 13
Crystal-Control Adapter for the BC-696—
Greeb ..... Apr., 54
Dial-Less VFO—Graham ..... May, 31
Easy Way Heterodyne Exciter—Mitchell ..... Mar., 21
Keying the Kilowatt—Johnson ..... Sept., 33
Modern 4E27A Final Amplifier—Fruend ..... Aug., 14
More on the 6146 ..... June, 26
No Clicks—No Backwave—Williams ..... Feb., 60
Put Your SCR-274N on 160 Meters—
Westervelt ..... June, 55
Putting the BC-625 on 220 Mc.—May ..... Nov., 17
Simple, Efficient Station-Control System—
Goodson ..... Aug., 18
Taming Parasitics in Your 6146—Marriner ..... Mar., 20
Ten-Meter "Handy Talkie"—Luisser ..... July, 46
Thirty Watts on Five Bands—Ferguson ..... May, 43
TVI-Free Transmitter for 40—Marriner ..... Oct., 28
Versatile 70 Watts—Hiser ..... Dec., 15
VFO Mobile Transmitter (Part I)—
Watkins ..... May, 59
VFO Mobile Transmitter (Part II)—
Watkins ..... June, 20
1953 Lazy Kilowatt—LeKashman ..... Feb., 12

V.H.F. and U.H.F.

G-String—White ..... Apr., 13
Getting on Novice Phone (Part II)—
Kephart and Brown (E.M.) ..... Jan., 23
Ottawa Six-Meter Story—Davis ..... May, 52
"Piggy-Back"—Bishop ..... June, 22
Putting the BC-625 on 220 Mc.—May ..... Nov., 17
Some Practical Results on the
Question of Antenna Height—May ..... Apr., 38
A Super/Super for 144 Mc.—
Brown (E.M.) and Kephart ..... Oct., 21
477,700-Mile DX on Two Meters—
Brown, E.M. ..... Mar., 54

War Surplus Conversions

Bandspread Dial for the Command Receivers—
Bostwick ..... Mar., 50
Crystal-Control Adapter for the BC-696—
Greeb ..... Apr., 54
Easy Way Heterodyne Exciter—Mitchell ..... Mar., 21
Put Your SCR-274N on 160 Meters—
Westervelt ..... June, 55
Putting the BC-625 on 220 Mc.—May ..... Nov., 17
Using Your 12-volt Dynamotor—Hileman ..... May, 51
40-Meter Mobile with your ARC-5—Lee ..... Mar., 62

Corrections to the First Edition:

RADIO AMATEURS' MOBILE HANDBOOK

page 72: The 12AX7 socket connections are in error and may result in wiring mistakes. The correct pin connections for this tube and circuit appear on page 62, Fig. 3-8-C.

page 79: The by-pass condenser between the plate of the 807 (after the parasitic choke) and the tank circuit is missing.

page 186: The value of T1 is arbitrary and may be one of the usual push-pull input transformers. Transformer T2 is recommended as a Stancor A[illegible].

CQ Ad Index

Allied Radio Corp. 63
American Electronics Co. 66
American Phenolic Corp. 11
Arrow Sales, Inc. 55
Barker & Williamson 60
Bliley Electric Co. 7
Bud Radio, Inc. 2
Burstein-Applebee Co. 66
C & H Sales Co. 67
Central Electronics, Inc. 59
Chicago Standard Transformer Corp. 52
Collins Radio Company ..... Cover 2
Columbia Electronics Sales 63
Continental Electronics & Sound Co. 8
Communications Equipment Co. 66
M. H. Dossett Co. 64
Eitel-McCullough, Inc. 12
Fire Killer Mfg. Co. 62
General Electric Co. 1
J. J. Glass Co. 60
Gotham Hobby Corp. 62
Guardian Elec. Mfg. Co. 56
The Hallicrafters Co. ..... 34 to 39
Harvey Radio Co., Inc. 51
Heath Company 49
Hughes Research & Development Lab. 10
Instructograph Co. 62
E. F. Johnson Co. 4, 5
K & L Radio Parts Co. 61
Lettine Radio Mfg. Co. 64
James Millen Mfg. Co., Inc. 6
Motorola, Inc. 67
National Company, Inc. ..... 72, Cover 3
Ohmite Manufacturing Co. 9
Palco Engineering, Inc. 59
Petersen Radio Co., Inc. 14
Power-Tran 56
Radio Corp. of America ..... Cover 4
Regency Division, I.D.E.A., Inc. 57
John F. Rider Publications, Inc. 65
Selectronic Supplies, Inc. 62
Sun Parts Distributors, Ltd. 65
S & W Electronics 54
TAB 72
Tallen Company, Inc. 64
Trans-World Radio-TV Corp. 66
World Radio Labs, Inc. 53

CQ!

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Mail your letter to *Edison Award Committee, Tube Department, General Electric Company, Schenectady 5, New York.*

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Fire up the rig, OM,
Tune it to a star.
Many a Wise man reads the sky,
And listens from afar.
And through the evening firmament,
O'er all bands, crystal clear
This message, to all mankind sent:
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Merry Christmas

and

A Happy New Year

from the CQ Staff

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communications receiver

Here is the set you've dreamed of—the set that has everything—the new Hallicrafters SX-88. On the next pages are listed some of the outstanding features that make this set what it is. But before you look at them, think. What do *you* want most in a communications receiver?

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Single Side Band Suppressed Carrier. Two beat frequency oscillator injection levels to accommodate CW and SSSC. Beat frequency oscillator slug tuned for maximum stability. Oscillator circuits compensated to eliminate frequency drift with temperature change or line voltage variation.

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see next page...

*Advanced circuitry like this...**

*Second conversion oscillator

*Beat frequency oscillator

*Cathode follower IF output

*Crystal calibrator

Make the hallicrafters **SX-88** *the fine*

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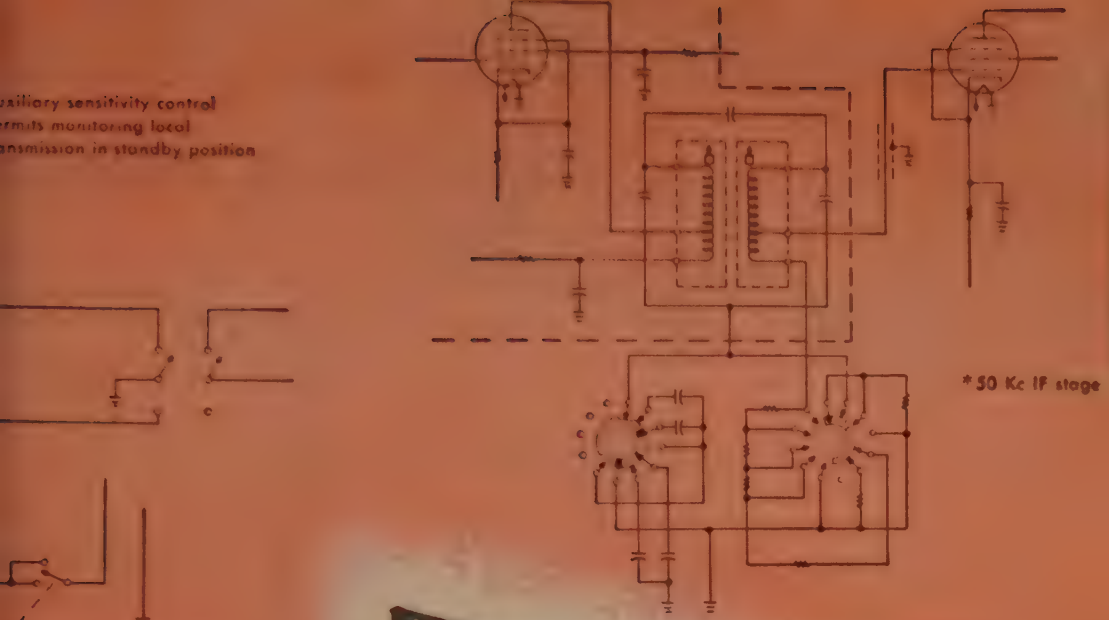
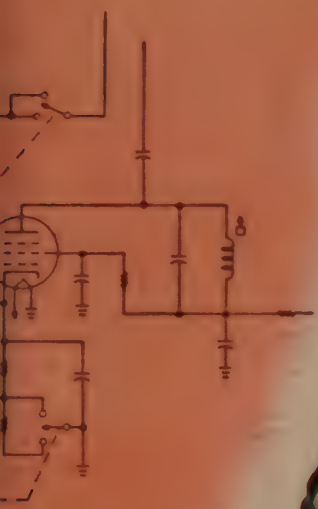
ansmission in standby position



*50 Kc IF stage



Chassis design
like this...

mateur receiver in the world!

Only hallicrafters SX-88 brings you all these features—everyone a necessity today!

1. Heavy gauge steel welded chassis for mechanical stability.

2. Full precision gear drive for main and band spread tuning.

3. Six position Band Width Control (selectivity) from 250 cycles to 10 kc.

4. 10 watt inverse feed back and push-pull audio output.

5. Exhalted B.F.O. for tops in single side band reception.

6. Buffer amplifier in B.F.O. circuit.

7. Antenna trimmer.

8. Amplified and delayed A.V.C.

9. Built-in 100 kc calibration crystal.

10. Second conversion oscillators crystal controlled.

11. Inertia tuning (flywheels both dials).

12. Full frequency coverage from 535 kc to 33 mc.

13. Calibrated electrical band spread 160, 80, 40, 20, 15, 11, and 10 meters.

14. Logging scales on each tuning shaft.

15. Dial locks on each tuning shaft.

16. Tuning dial indicators resettable from front panel for maximum calibration accuracy.

17. Auxiliary A.C. socket on rear of chassis.

18. Illuminated band-in-use indicator.

19. Illuminated S meter.

20. Dual S meter calibration S units and microvolts.

21. Auxiliary power socket plus .6 amps at 6.3 volts and 10 ma at 150 volts for accessories.

22. Standard 8¾" by 19" panel for rack mounting if desired.

23. 50 kc I.f. output jack via cathode follower for teletype converter, etc.

24. Five position response control (tone control).

25. Two r.f. stages (Bands 2 to 6).

26. 17 tubes plus voltage regulator, ballast tube and rectifier.

27. Automatic noise limiter circuit.

28. Phono Jack

29. Audio output transformer for 3.2, 8, 500/600 ohm loads.

30. Fuse for overload protection.

31. Auxiliary sensitivity control permits monitoring of local transmissions in standby position.

Front Panel Controls

Main tuning.

Band spread.

Band Selector 6 positions.

Volume: 0-10 and AC/off.

Band width in kc: 10, 5, 2½, 1¼, .5 and .250.

Pitch: (B.F.O.)

Response: Bass Boost, High Fidelity, Normal, Communications. (Comm. 1, Comm. 2)

Antenna trimmer

Sensitivity 0-10.

Front Panel Toggle Switches

Noise limiter on/off.

A.V.C. on/off.

Calibrator on/off.

Receive—standby.

C.W.—AM—SSSC (single side band suppressed carrier).

Chassis Rear

Speaker terminals 3.2/8/500-600 ohms.

Antenna terminals 52-600 ohms.

AC Accessory socket 117 volts at 250 watts.

Power socket—Octal for external power supply to receiver, such as batteries, and in addition, this socket supplies 6.3 volts at 600 ma and 150 volts dc at 10 ma for future accessories.

I-F output jack.

Audio Input—phono jack.

Fuse holder for AC power circuit.

Standby sensitivity control (access through cabinet cover).

Frequency Range
(Main tuning dial)

Band 1—535 to 1710 kc.

Band 2—1690 to 3080 kc.

Band 3—2980 to 5570 kc.

Band 4—5370 to 10,000 kc.

Band 5—9.8 to 18.3 mc.

Band 6—17.8 to 33 mc.

Sensitivity

Bands 2 to 6—1 microvolt for ½ watt output. 1 microvolt for 10 db signal to noise ratio.

Band 1—10 microvolts for ½ watt output.

Image Rejection

Not less than 80 db on frequencies lower than 20 mc.

Not less than 60 db on frequencies from 20 to 30 mc.

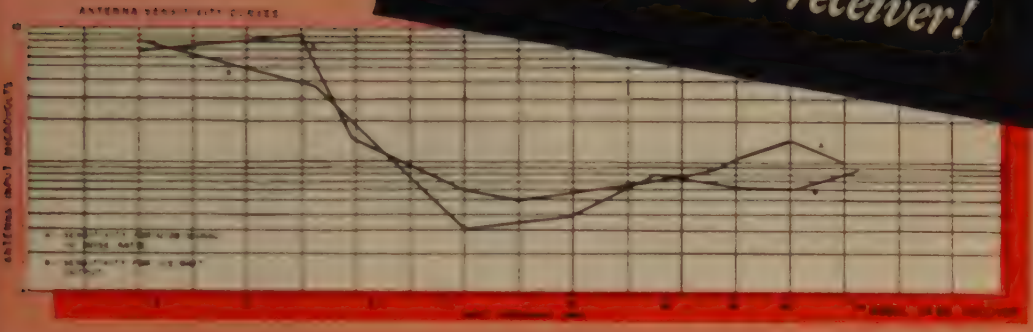
Spurious Responses
(I.F. and oscillator tweets)

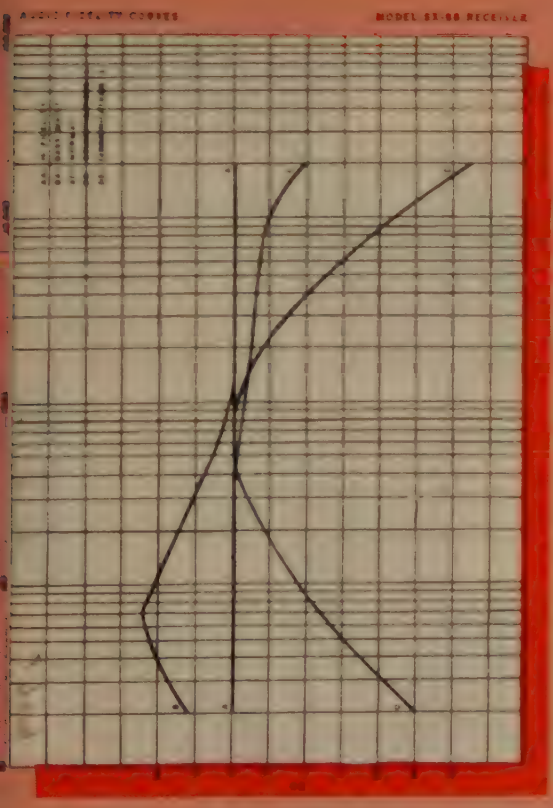
Not less than 80 db except at 1700 kc where it is not less than 50 db.

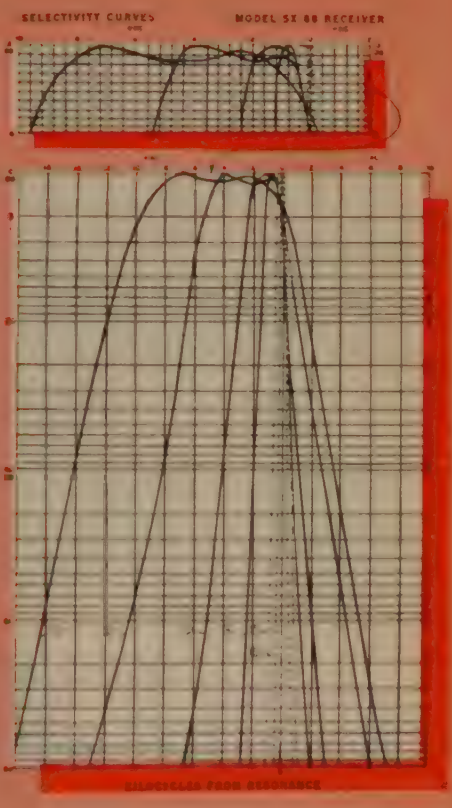
Band Width—(Selectivity)

Position	6 db (nose)	60 db (skirts)
10 kc	10 kc	30 kc
5 kc	5 kc	15 kc
2.5 kc	2.5 kc	7.5 kc
1.25 kc	1.25 kc	3.75 kc
.500 kc	500 cps	1.50 kc
.250 kc	250 cps	850 cps

These curves tell the story ... compare with any other receiver!







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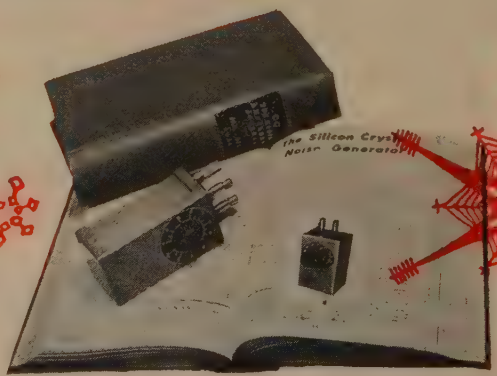

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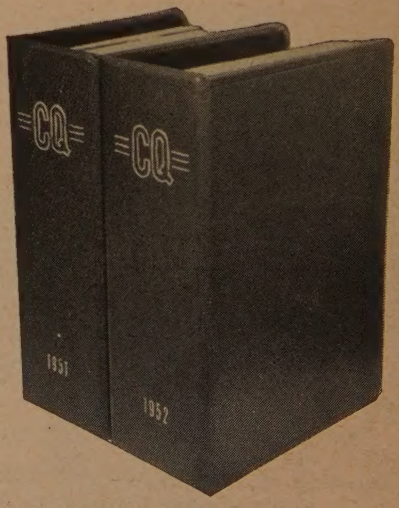

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